

# DISCOVERY

A Monthly Popular Journal of Knowledge

October 1936

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By a Special Correspondent



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By E. N. Fallaize



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# DISCOVERY

A Monthly Popular Journal of Knowledge

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## Notes of the Month.

ONLY a slight ripple on the normal pleasure-seeking surface of Blackpool was caused by the arrival and departure of the British Association. Except perhaps in the rarefied atmosphere of that room in the Imperial Hotel set apart for the meals of some of the most distinguished representatives of the Association, members felt themselves almost lost, stray meteors wandering in an unfamiliar medium. In compensation, the hospitality provided was traditionally Lancastrian in its warmth, and members found their material interests exceptionally well looked after. Considerable support was accorded the Association by local residents, but a feeling was expressed that even more local members would have been forthcoming if it had not been taken quite so much for granted that the entire population of Blackpool knew what the Association was and what were its functions. Actually, the reverse was the case and many regrets were expressed locally: "If we had only known earlier . . ."

\* \* \* \*

The policy of holding combined meetings of two or more Sections, with special reference to the services of science to public life, was faithfully and usefully carried out. One physical fact, however, militated against the most profitable working of the scheme; and it is hard to see how the difficulty could have been overcome in a purely residential town. This was the long distance between the various buildings which housed the sectional

lecture-rooms. The conscientious member, anxious to combine his sectional activities, was forced, unless provided with a car, to patrol many yards of residential street more or less at the double if he wished to attend various meetings punctually. Still, at the worst, he was merely adding physical exercise to mental. But the time-table might have been revised slightly in order to allow members resident in remote boarding-houses to keep to the rigid and peculiar meal-times demanded by Blackpool custom, and so to take full advantage of the excellent fare provided.

\* \* \* \*

The weather was no kinder than it has been on most occasions this summer; few visitors were induced to mount the Tower for the sake of the view; and the Saturday excursions were marred by a drenching morning. Without wishing to be captious, we might venture to suggest that the general excursions planned erred somewhat on the side of unimaginativeness. The Lake District is certainly one of the most attractive regions in England, and within easy reach of Blackpool; but many members would have welcomed a tour of the manufacturing towns of Lancashire, both to see the sort of place that the Blackpool visitor comes from, and to visit lesser known points of interest, such as Astley Hall, Duxbury Hall, Samlesbury Hall, and Hall-i'-th'-Wood, with its memories of Hargreaves; Clitheroe Castle and Hoghton Hall, of "sirloin" fame; and the ruined abbeys of Cockersand, Whalley, and Sawley. This is a minor complaint, and not directly connected with the work of the Association, and the "visits to works," etc., were admirably chosen and organised.

\* \* \* \*

Any visitors to Blackpool who happened to be coming back in their own cars from Saturday or Sunday excursions, and came face to face with the headlights of the traffic returning from seeing the illuminations, will welcome the discovery, reported recently in the *Morning*

*Post*, of a method of polarising, on a commercial scale, the light of motor headlamps. The problem placed before the manufacturer has always been how to reduce the effect of dazzle without dangerously lessening the illuminating power of the headlamps; and it is claimed that the recent invention, in the U.S.A., by Mr. Edwin H. Land, achieves this end. Polarised glass has for some time been used, in a small way, in certain scientific instruments, but Mr. Land's invention consists in the application of a sheet of transparent material, known as Polaroid, to both the lamps themselves and to the windscreen. The effect of this is to make the lamps of approaching cars appear merely like glowing silvery discs, while the illumination of the road by their rays remains unimpaired. One effect of this beneficent discovery will be to render unnecessary the regulations for dipping and extinguishing headlights; and at the very least it should remove one of the greatest inconveniences of night driving.

\* \* \* \*

The news of the shipwreck of the *Pourquoi Pas?* and the drowning of Dr. Charcot is the worst blow that the science of polar exploration has suffered since the death of Gino Watkins. Yet, like Watkins, Charcot died on service within the high latitudes that he had made his own, and it is more appropriate that the Iceland seas should have claimed him as a victim than that he should have died in his bed, or, like another great French traveller, in a paltry accident on a suburban railway. Charcot's work both in the Arctic and the Antarctic regions was appreciated as widely in Britain as in his own country; perhaps his most picturesque exploit was his successful landing on the remote islet of Rockall, that loneliest outpost of the European shelf extending into the North Atlantic. But all engaged in circumpolar work regarded him as guide, philosopher, and friend, and his death is an irreparable loss to geographical science. Only the lucky escape of a single survivor of the crew, a hardy Breton sailor, has enabled us to have some idea of the details of the tragedy.

\* \* \* \*

The approaching autumn will mark the close of the excavations in Maiden Castle, the most magnificent relic of prehistoric civilisation in Britain. Dr. Mortimer Wheeler and his associates are to be congratulated on their splendid and revealing work there, which has thrown so vivid a light on the conditions of life in this country before and at the beginning of the Roman

occupation. An editorial note is not the place to go into the details of what has been discovered. It is enough here to say that the finds have been of the highest interest and importance, and the accounts that have appeared at intervals in *The Times* and elsewhere of the discoveries of walls, roadways, and relics of buildings, as well as single objects such as coins, weapons, and vessels, make every archæologist eager for the publication of the full report. That on Verulamium has just appeared; this one will be even more fascinating, dealing as it does with a more unfamiliar horizon.

\* \* \* \*

In the middle of last month the exhibition at the Bodleian Library, celebrating the tercentenary of Harvard University, opened its doors, to remain open for some two months. It is singularly fortunate that this occasion should have coincided with a notable increase in the number of American visitors to this country; and the magnetic attraction that Oxford has for such visitors makes the Bodleian a convenient setting for the exhibition. Many could have said that Cambridge, the *alma mater* of John Harvard himself, would have been more appropriate, but Oxford can claim to have produced the first Harvard graduate, and to have been the first to recognise the Harvard B.A. degree on equal terms with its own. The question of appropriateness is a small point, in any case; the main thing is the exhibition itself, which is of first-class interest, and deserves a visit from all interested in the history of education, apart altogether from its American appeal.

\* \* \* \*

The University of London has just published its list of University Extension Lectures, arranged for the forthcoming Session. These lectures, held in many parts of London and the suburbs, are given at hours convenient to those engaged in day-time occupations who wish to devote some part of their leisure to the study of the humanities. Courses on History, Literature, Biblical Studies, Architecture, Painting, Psychology, Philosophy, Political Science and Economics will be found in the programme. The B.B.C., too, is taking an interesting part in popular education, apart altogether from the special broadcasts to schools. Mr. Henry Williamson is giving a series of four talks on "Lives of English Animals." The first, on the Red Deer, was broadcast in the National programme on September 28th, at 7.30 p.m., and will be repeated on October 5th, at 5 p.m. The second, also in the National programme, will be heard on October 28th, and the subject will be the Otter.

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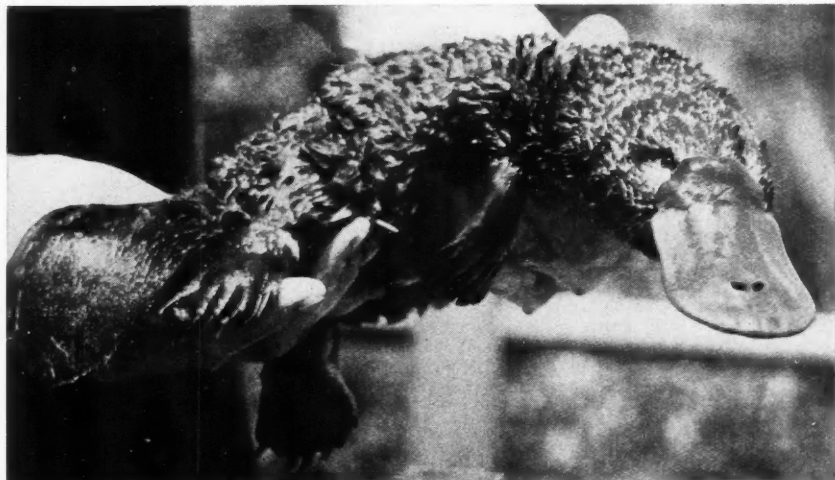
## Strange Mammals from Australia.

By Edward Samuel.

*The few specimens of Australasian monotremes and the less well known marsupials that find their way in to the zoological gardens of the Northern Hemisphere give but a shadowy idea of the intensely active life they live at home. Mr. Samuel's personal acquaintance with the fascinating and really marvellous animals in their native haunts lends his account of them a refreshing vividness and reveals some little-known facts.*

IN Australia we have in marsupials the maximum variety of strange forms; there is nothing to compare with them throughout the world and the only egg-laying marsupials are found here. This continent is stocked with many types of animals whose ancestors died out long ago elsewhere. This description applies most aptly to the platypus and its egg-laying cousins.

The platypus, which is



*Above is an unusually fine close-up study from life of the platypus. On the left the female platypus is shown by flashlight on her underground nest.*

One scientist gave it the most suitable name, *paradoxus*, and a veritable paradox it is, with its furry mammal's coat, duck-like bill, and webbed feet. The early scientists would have been even more astounded had they known that the platypus lays eggs, yet suckles its young in the mammalian way. Dead specimens were sent overseas but were quite frankly discredited, in fact the platypus was treated with no more respect than the calf with three heads and other freaks at a sideshow. Eventually scientific research placed the platypus in a

sub-class of the group of mammals containing all the furred, milk-suckling, air-breathing, warm-blooded vertebrates.

The platypus is confined to the region of Australia lying east of 138° E. long., excepting Cape York and Tasmania. They inhabit a varied range of waters from icy streams on the Kosciusko Tableland to the warm waters of Queensland, from lakes to water-holes. The adult male is about two feet long, including a six-inch

called the duckbill, watermole, ornithorhynchus, etc., was first observed in New South Wales in 1797, on the banks of the Hawkesbury, and was described as an amphibious animal of the mole species. Quite accurately it was described as having, instead of the mouth of an animal, the upper and lower manibles of a duck. By these it was able to supply itself with food in muddy places, while on shore its long and sharp claws were employed in burrowing.

tail, the coat is of velvety amber fur above, and a lighter colour below. The snout resembles a duck's bill, though it is not horny, but soft and moist, of leathery flexible skin charged with nerves; it is a sense organ. This muzzle is suitable for working in slush in search of food such as molluscs or small prawns, while mud and sand is at the same time absorbed, apparently as an aid to mastication.

The fore foot is both the main swimming and burrowing organ, a unique example amongst mammals of a sort of reversible adaption for very diverse functions. On land the portion of the web extending beyond the claw, when swimming, is folded back under the palm so that the claws can be used for burrowing.

A marsupial pouch is superfluous, owing to the animal's aquatic habits, and the tunnelling habit has been adopted to provide shelter, the burrows being of two different kinds. There is the resting burrow, or general living quarters, where males and females live separately, which has nothing in common with the more elaborate nesting burrow, constructed separately by the female, wherein she lays her eggs and rears her young. The low-arched breeding tunnel conforms to the body, and the burrow averages from 15 to 60 feet long. It is two feet underground, and the entrance is above water. Nests are built of grass and gum leaves, willow switches, or frayed reeds.

The period of incubation is about 14 days, and the mother does not leave the nest from the time the eggs are laid until the young are able to suckle. During the incubation the mother platypus holds the eggs, as she

does the newly-hatched young, in the middle of her curled-up body. This embrace brings them in the proximity of her breast where their struggles stimulate the flow of milk, which exudes from enlarged pores and is sucked from the skin.

The performance of the female on retiring to lay is really remarkable. She burrows, and plugs the burrow behind her with from three to nine barriers or doors of

soft earth about 6 to 8 inches thick, which she taps firm with her tail. The bare state of her tail at this period is evidence of this. This cunning device of barriers protects her from enemies, and makes an ideal home for brooding. It is not to prevent flooding as the nest is higher than flood levels.

The platypus generally feeds in the early morning and at twilight, and is by no means so aquatic as one would think, spending less than 2 hours a day in the water. As regards offensive weapons the male has spurs which eject poison, not very venomous but capable of causing fatal results to small animals.

Surely in creation there is nothing more

wonderful than the platypus—every feature of this mammal seems made to order, for example, when under water, one muscle closes eyes and ears to fit the creature for its submarine task.

The platypus is by no means scarce, and as this wonderful animal wisely is protected there is little danger of losing such a curiosity in the zoological world.

The platypus has a rather close relation in the spiny ant-eater or echidna, which is found on the mainland of Australia, Tasmania, and New Guinea. It is often



*A horde of flying-foxes roosting on a tree in North Queensland. Three acres of bush in the vicinity were occupied daily by this omnivorous pest.*

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It is often

called, quite in-  
appropriately, a  
native porcupine.  
Anyone acquainted  
personally with  
echidna will agree  
that "spiny ant-  
eater" is the most  
suitable name, as  
our friend has a  
spiny protective  
covering of quills  
developed from en-  
larged hairs, and  
as to the latter  
part of the name,  
the natural food  
consists very largely  
of ants.

It is interesting  
to notice the way  
the food is obtained:  
the echidna rapidly  
thrusts out a long,  
sticky tongue and  
the ants and other  
small insects adhere

to it. While the platypus has a flattened snout like a  
duck's bill, the echidna has a long slender pointed  
snout. This is yet another good example of how different  
habits mould the appearance of closely related animals.

These ant-eaters are not tunnellers like the platypus,  
and their method of breeding differs, as the echidna  
carries its eggs in a pouch. Remarkably enough, this  
pouch forms only  
during the breeding  
season, and in it the  
egg hatches and the  
young one remains  
at home and is car-  
ried, until the spines  
become really  
troublesome to its  
mother. It used to  
be generally con-  
sidered that the egg  
was laid outside and  
placed by the parent  
in the pouch. How-  
ever, study illus-  
trated that the paws  
are quite unsuitable  
for such a delicate

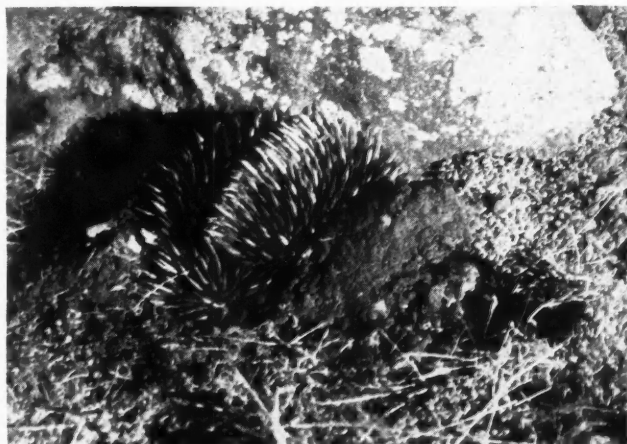


*A friendly group of Australian "opposums."*

when it "sports the oak" and curls up tightly the  
tender under-parts are entirely protected. Another  
peculiar feature about these spines is that they have a  
remarkable capability of clinging tightly to the ground,  
and if the earth surface is suitable, of digging rapidly  
downwards into the ground, providing an excellent  
means of avoiding enemies; and, of course, the spines

come in extremely  
handy for a rear-  
guard action. In  
addition, the animal  
is armed with greatly  
enlarged claws,  
operated with an  
extraordinary  
rotary action.

The platypus has  
juvenile teeth, which  
are later replaced by  
horny plates. In  
the ant-eater teeth  
are absent, and there  
are instead numer-  
ous horny serrations  
on the back of the  
tongue, which grind



*The echidna in a characteristic posture of defence; nothing is visible but a mass of hostile spines.*

against hard ridges on the roof of the mouth to break up food. The meal partaken of by the echidna is mingled with a considerable amount of dirt, which, apparently, aids as a digestive and by grinding up the food. Aborigines consider the ant-eater a savoury dish baked in coals.

Although the echidna, on account of the fact that its activities are confined to dry land, may not be such a marvellous animal as the platypus, it is still of great interest and has provided naturalists with much food for thought and investigation owing to the close relationship it bears to the platypus. Like its relation, the echidna is still numerous and needs no protection, it is well armed, and there is little chance of this curiosity becoming extinct.

Mention the name "Flying Fox" to an Englishman, especially if he is a sportsman, and he will at once jump to the conclusion that you are referring to one of the greatest racehorses in history—mention the same name to an Australian and he will know that you are speaking of an unmitigated pest, which, however, is to a certain extent extremely interesting from a zoological point of view.

The home of the flying fox is mainly in Queensland (northern); at Rockhampton often the whole sky is an

amazing sight, as when climatic conditions are favourable it is filled with an immense number of these curious animals on a raid. The flight is often a mile wide, and as far as the eye can see to east and west the flapping animals show black against the evening sky. As a rule they travel from camps among the mangroves near the mouth of the Fitzroy and other rivers, making for the cultivated areas further inland.

It is interesting to get among the "foxes" and watch their marauding expeditions at the close of day. They never fly as a flock, but each one is undertaking a solo flight. Usually, they keep at a great height, but many are burdened with young ones, and the air is full of the sound of wing strokes from these low-flying laggards. Unlike many human mothers, a flying fox mother never leaves the baby at home, but always carries it about clinging to the breast, even when it looks as large as herself.

### Flying Fox "Camps."

A big camp of flying foxes is a fascinating but most unpleasant place to visit. If it is among the mangroves, on the coast, it is a very muddy trip to get there, and it means facing unbearable swarms of mosquitos. If the camp is in the depths of the scrub, prickly lawyer cane, called wait-a-while, stinging trees, land leeches and scrub ticks have to be faced and the task is no light or pleasant one. There is no trouble to locate the camp, a foul musky odour providing an infallible guide. Once at the camp the foxes will be found hanging in their thousands on a huge tree or two, as thick as grapes on a vine, suspended up-side down by the hind claws. Folded up and inanimate they look like monstrous insect pupal cases, each hanging by a thread, or like big queer fruits.

Just before sundown the giant bats go off quietly on their way to raid orchards. About an hour before departure they are always very restless and the camp is a pandemonium for a while after they return just before dawn. They fight and quarrel for the use of the higher and safer limbs. Of all gregarious things flying foxes are the worst tempered, the least in accord. Wherever they are it is each for itself and the devil take the hindmost. Here and there where no suitable branch is available they will cling to one another instead, and often an overtaxed limb crashes with their weight.

In the north of Australia most of the "Pest Boards" offer a bonus of so much a head for them and at big camps shooters often do well, as eight foxes can often be brought down with one barrel; but on the ground a wounded bat is a nasty proposition, and will savagely attack a man's leg.

The small insect-eating bats cannot rise up straight from level ground, but have to climb to find a suitable



*An amusing picture of a flying opossum, illustrating its size.*



take-off; the flying bat proper can certainly rise from the level.

Before the advent of the white man and his cultivated fruit, these great fruit bats lived on scrub figs, berries, ti-tree and gum blossoms for the honey they contained. To-day they are a serious menace to northern fruit-growers, playing havoc among apples, plums, apricots, figs, and so on. In New South Wales the only variety is the grey-headed flying fox, which reaches as far as Victoria, but on the mainland farther north there are at least half-a-dozen different species.

At close range they are not unattractive, with their bright and intelligent black eyes, fox-like heads and slender muzzle, sharp small ears and beautiful soft fur. No commercial use has yet been found for the fur or skin. Had it been otherwise a solution might have been found for the flying fox menace.

We know little of "high life" in our Australian forests, of the everyday doings of furred dwellers in the green mansions of the tree-tops. In museums we can inspect specimens and at the Zoo living opossums, "flying squirrels," and some of the other furred acrobats of the trees. But mostly only glimpses are gained of these alluring little animals in their wild state. The beautiful flying phalangers are mysterious as shadows, on their gliding dives in the moonlight.

Actually, it took a moving picture to reveal the mode of the squirrels' flight. These marsupials, of course, do not really fly, but make gliding journeys through the air, supported by the narrow flying membrane of the flanks.

#### Opossums Often Too Tame.

Silver-grey, ring-tail opossums, as well as flying squirrels, live in comfort not only in the country but in the closest suburbs of Sydney. Wherever there are gum trees opossums have cosy little "huts" around the bole and a few feet from the ground. These animals become very tame and, indeed, are often a nuisance as they will enter houses at night and canter around, making a great din, and they frequently make their nests down the chimney.

In the haunt of the shyer flying phalanger you may see a dark long-tailed form appear from the shadows and move along a lofty horizontal bough, crouch at the end, then leap into space, to glide swiftly downward, and alight safely on the trunk of a distant tree. When near its objective, the flying squirrel checks its speed by a quick and graceful curve upward, and makes a clever landing on the tree trunk.

There are four kinds of *Petaurus*. All wear very soft fur coats, have pretty heads and beautiful eyes and are shapely. The great flying phalanger of eastern Australia has a magnificent tail, that any Persian cat might envy,

and has long, silky, soft fur. The home of the big squirrel is among the loftiest branches of the tallest gum tree. Heard after dark in the forest, during the mating season, its call is startling—the loudest voice of the night—in fact it seems almost impossible that so small an author can produce such a volume of sound.

There are many varieties of flying phalanger, the yellow-bellied 25 inches in length with a busy tail an inch longer than the body. The squirrel flying phalanger, 21 inches long, has beautiful colouring to its fur, pale grey above, with a dorsal band of dark brown or black. In spite of its pretty, innocent, little face, this flying squirrel can become a fury in fur, and if annoyed it makes a curious whirring noise, and is prepared to bite savagely—its sharp teeth could go through a finger. The "sugar squirrel" of the eastern States is only 15 inches long.

#### The Flying Phalanger.

The pigmy flying phalanger, well named (*Acrobates pygmaeus*), live in family groups, with their home in a tree hollow near the ground. Nests are formed of gum leaves or shredded bark. These tiny, grey-furred creatures—about the size of a common mouse, with a feather-like tail—are insect eaters; they jump cleverly from perch to perch, and enjoy long gliding journeys through the air.

Australian opossums are phalangers too, but everyone calls them by the name which really belongs to a group of American marsupials. It was pedantic to use the scientific term for the best known of all our furred acrobats. The vulpine opossums have suffered for possessing coats of special value to the fur trade. Millions have been trapped. In Victoria, in one season alone, the number of silver-grey opossums killed exceeded half-a-million. Only years of protection could enable a species to recover from such wholesale trapping.

In Queensland, striped opossums are found, beautiful little creatures with long bushy tails; the fur is white above, with three longitudinal stripes of brownish black, and on the chin is a black "beauty spot."

The tribe of flying acrobats is far too attractive, too precious a gift of nature to be allowed to be ruthlessly slaughtered to extinction. It is pleasant to note that the Government is taking active steps to deal drastically with those who make a practise of illicit dealing with squirrel or opossum skins in close season, and several convictions exposing trading in thousands of skins have been revealed, so that the police have recently established at the Criminal Investigation Branch a special skin bureau to deal with the traffic. The koala, in its helpless innocence, was almost wiped out of existence, and lovers of nature will delight that their first cousins are to be saved.

## The British Association at Blackpool.

By Our Special Correspondent.

*Some outstanding papers read at this year's meeting of the British Association are here briefly reviewed for the benefit of those of our readers who were unable to be present. As promised, the connection between science and the life of the nation was the keynote of a great number of the contributions, and the combined meetings were especially helpful in this direction.*

SUCH reproaches as last year were levelled at the British Association on the grounds of its methods of procedure and the danger of over-specialisation were, we venture to think, effectively countered at this year's meeting. The most captious critic could scarcely fail to admit that a broadminded and genuinely co-operative spirit inspired the entire meeting, and that highly technical and specialised discussions were in a small minority.

### New Section Suggested.

The President, Sir JOSIAH STAMP, almost at the outset of his inaugural address—itself entitled, "The Impact of Science upon Society"—made use of a sentence which revealed the outlook of the whole meeting. "The reactions of society to science," he said, "have haunted our presidential addresses with various misgivings for some years past"; and he referred to the famous centenary address by General Smuts, which, so to speak, set the science-society ball rolling. One result of this attitude, which is hardly to be wondered at, is the suggestion that a new section, devoted to Sociology, should be added to those already formed. What will come of this suggestion it is too early to say, but it is, perhaps, significant that the letter which would fall to be allotted to this section is "N."

The inaugural address was delivered in the vast Empire Ballroom, which, with its galleries, easily accommodated a large and appreciative audience. The Treasurer announced that the number of members who had joined up to date was slightly under 2,000; this was a smaller number than at the corresponding occasion last year, but judging by the continual activity at the membership desk in the reception room, the final membership will be little, if at all, less than the 1935 total. The trouble was, as is commented upon elsewhere in this issue, that Blackpool had not been made sufficiently B.A.-conscious. At the close of the address all were delighted to hear Sir OLIVER LODGE call for a vote of thanks.

The choice of an economist for President this year, whether intentional or accidental, was certainly fortunate. And the inaugural address, succeeding those of an engineer, a biochemist, an astronomer, and a geologist, performed the function of summing up, from the point of view of man as an economic unit affected by the progress of science, the points that the more

strictly technical scientists had made regarding the relationship between science and humanity. The economist is a technician only because we live in a mechanised age; in a simpler epoch he might have been an agriculturist; but, throughout, his function is to discover how men may derive the greatest material comfort, in the highest sense, from the economic circumstances that surround them. The President gave us a most lucid exposition of the good and evil effects of science on present-day humanity. He would not dogmatise as to how far the scientist should become a social reformer, but he sounded a note of warning on the possibility of science making things too easy, and impairing the powers of general thinking. He quoted the simple words of the darkie mother: "If you haven't an education, you've jest got to use yoh brains." His experience was that when the attempt to deal with social consequences is made, we quickly find ourselves either in the field of larger politics debating the merits of the three prevalent forms of state government, or else performing miracles with fancy currencies and their blue prints reminiscent of the chemical engineer.

### Problem of Unemployment.

A comprehensive review of the problems of unemployment suggested many points for future discussion, notably the question which a falling population is likely to bring to the fore very soon. As he said, "a natural increase of population is the best shock absorber that the community can possess," but the question is, what will occur with stationary and declining populations? A further problem was the unemployment caused by the direct impact of science, and the President discussed this from two angles: the modification of the impact to meet the nature of man, and the modification of the nature of man to meet the impact. Some of the evils brought about by the impact of science could only be cured by more science, and ordered knowledge and principles were wanted at every point, the kind of remedy required here being covered by the work of the National Institute of Industrial Psychology. The President's final words summed up the whole situation. "My predecessors," he said, "have spoken of the shortcomings of the active world—to me they are but the fallings short of science. Wherever we look we discover that if we are to avoid trouble we must take trouble—

scientific trouble. The duality which puts science and man's other activity in contrasted categories with disharmony to be resolved, gaps to be bridged, is unreal. We are simply beholding over-extending science too rough round the edges as it grows.

"What we have learnt concerning the proper impact of science upon society in the past century is trifling, compared with what we have yet to discover and apply. We have spent much and long upon the science of matter, and the greater our success the greater must be our failure, unless we turn also at long last to an equal advance in the science of man.

The unemployment question was dealt with in further detail by Sir WILLIAM BEVERIDGE in his "Analysis of Unemployment in Britain" delivered to Section F. Sir William pointed out that nothing is more misleading than to consider "the unemployed" as a homogeneous mass; the total must be broken up and analysed in various ways: by industries, by duration of unemployment, by age, and by sex, to mention only some of the most important subdivisions.

#### "Friction" Unemployment.

Even industries now prosperous and expanding show percentages of unemployment of 6 or more. "Friction" due to people being of the wrong type or the wrong place to meet the demand, and seasonal fluctuations, account for a very substantial volume of unemployment not likely to be abolished by increase in the demand for labour. On the other hand other industries, depressed and contracting, have large bodies of unemployed labour for whom an increase of demand is unlikely—the "industrial level core" of unemployment, while it must be remembered that no less than 17 per cent. of registered unemployed receive neither benefit nor assistance.

An interesting fact which he brought out, and illustrated by one of a most helpful series of statistical tables, was that, though the risk of losing one's job does not increase appreciably with advancing years from 35 to 64 and is highest before 35, the difficulty of finding fresh employment, once a job has been lost, whether through general depression or through individual misfortune, does increase materially with age. Social steps seem to be called for to help older men of proved industrial capacity to find new openings, and to counteract as anti-social the common tendency of employers to snatch at youth. An employer of labour who joined in the subsequent discussion pointed out the disadvantages from his point of view of introducing older men into a business, citing grave moral objections. While it was agreed that his attitude was to be deplored in an individualistic state, and would be impossible in a socialistic

one, it was perhaps unfortunate that no remedy was offered for the objections that he raised. The most serious problem of all was that of unemployment of a duration of twelve months or more—at present nearly a quarter of the total. Here physical, mental, and moral deterioration set in, and money payments were insufficient to meet the needs of the case.

#### Ambiguity of "Race."

A very interesting discussion between members of Sections H (Anthropology) and D (Zoology), with DR. J. S. HUXLEY in the chair, had for its subject, "Genetics and Race." The chairman advocated the excision of the term "race" from the geneticist's vocabulary and asked for the substitution of some less ambiguous word. He pointed out that the anthropological use of the term dates from the time when it was believed that inheritance was of the blending type; if this were so, a mixed population would speedily approximate to a characteristic uniform type. This assumption has been shown to be incorrect by the establishment of the Mendelian basis of inheritance. After crossing, recombinations of every possible kind will continue to appear indefinitely unless some are eliminated by selection. He was preceded by PROFESSOR H. J. FLEURE, who pointed out that the larger groups of man have bred among themselves each for each, with little intermixture, until our day, and have felt diverse environmental influences. So main groups might almost be called species. Within the main groups there is much diversity in spite of interbreeding. The modern study of genetics shows us how this may have happened, but we know too little of pedigrees to be able to demonstrate the case in man. Intermixture in the past has been largely local, and appears to have promoted survival of many *strains* in a population for very long periods. We have no right to assume the existence of a uniform population—*i.e.*, a pure race or strain—at any time in the past, or the likelihood of this in the future. DR. G. M. MORANT inclined to support the classical theory of race in man, though, as he said, this is to-day generally discredited. According to the alternative and now generally accredited theory, populations of the kind considered are never mixed uniformly, but there is a general tendency for recombinations of the ancestral types to occur in them. This admits the possibility of discovering the racial components of a population from a study of its living members alone. Observed facts of a statistical nature apparently conflict with this second theory: these concern the forms of the distributions, variabilities and correlations of characters in existing and extinct populations. A definite pronouncement by geneticists in favour of one or the other of these views

would resolve many of the difficulties faced by anthropologists in their attempts to define the concept of race in man. PROFESSOR CARR-SAUNDERS brought historical evidence to bear on the subject, and PROFESSOR RUGGLES GATES made the point that, genetically speaking, if we apply the same criteria of species to man as are applied to the higher mammals, it is necessary to recognise the existence of several species of living man. *Homo sapiens* is an anthropological convention, surviving from the time when intersterility was regarded as an essential criterion of species. Duplicate factors, which occur in human "races," are characteristic of species rather than varieties. PROFESSOR CREW demonstrated that, as the classifications of the anthropologist related to physical characteristics which were in the main genetic characters, it followed that any classification of man by reference to hereditary characters which disregards principles which the science of genetics has shown to be correct, must necessarily be imperfect. The technique of genetics should now be added to those of anthropology and genetic analysis of human differences and the correlations between them should be undertaken.

Section H also found much interest in a number of papers dealing with the folk-tale. DR. E. WILSON illustrated his paper on the "Folk-tale in Westmorland and North Lancashire" with a number of racy anecdotes in dialect. A proof that the folk-tale was tenacious of life even under modern conditions was afforded by one that is related of Hazel Grove, the "Gotham" of Lancashire, which depended for its point upon a knowledge of motor-cars. MR. O DUILEARGA gave an enthusiastic exposition of the work of the Irish Folklore Commission, a body created to collect the oral material of a folk-tradition that is still existing under ancient conditions and is threatened with rapid extinction. An important point was that the best collectors of tales were men of the people themselves—fishermen, postmen, and so on—who could take down tales from dictation, told without a trace of self-consciousness. A great mass of important material is being stored up of a kind which could have been collected in England not so very long ago; the Irish authorities are taking advantage of an opportunity which has been lost for ever in Great Britain. MR. HORNELL followed, with a beautifully illustrated paper on coracles and currachs, which are employed far more extensively in the British Isles than might be imagined. The discussion which followed failed to settle where they originally came from.



(Photo, Valentine and Sons, Dundee)

### *The North Shore at Blackpool.*

The presidential address to Section E (geography), presented by BRIGADIER WINTERBOTHAM, was in many ways a surprise, and the Section had the advantage (as PROFESSOR DEBENHAM pointed out) of two presidential addresses, one written and one spoken. The subject was "The Mapping of the Colonial Empire," a subject which the speaker has at heart; beginning with a short account of the history of the Ordnance Survey itself, he worked up towards the mapping of outlying imperial territories. The real prime mover of colonial mapping was MAJOR JERVIS who, quite independently, had drawn and printed a set of maps which proved invaluable in the Crimean War. By 1855 this new idea had had time to become respectable. The "Topographical and Statistical Department" was formed, and Jervis, reminded of his "varied attainments," and of the "great attention" he had paid to "geographical Science" was offered the command, together with a coach-house and stables in Whitehall in which to start his dark and hidden calling. He was entrusted with the "compilation and printing of all maps required for military and political purposes: collection of maps published at home and abroad, and of topographical and statistical information about the colonies and foreign countries." Jervis was as significant a figure in colonial topography as Roy was in domestic. Nowadays the mapping of the colonies was being carried out in a somewhat piecemeal way; the principal task to be completed was the triangulation of the arc of the meridian 30° E. through Africa—jocularly known among survey officials as the "Arc of the Covenant"—which had been brought as far north as Lake Tanganyika in 1913, but only 360 miles of which had been dealt with since. On the West Coast a body of native surveyors, trained





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under SIR GORDON GUGGISBERG, had been doing some effective work. Public opinion, however, did not grasp the urgency of the problem, though the public suffers when there is no trustworthy map from which to work. Social, economic, industrial development cannot be divorced from land surveying. Mapping is indeed one of the vitamins necessary to the growth of the body politic yet never, for a century, have we treated our geographical duties so lightly.

In Section B (Chemistry) special attention was devoted to problems affecting large sections of the community. Not only was there PROFESSOR J. C. PHILIP's presidential address, on "The Training of the Chemist for the Service of the Community," and an interesting discussion on Electrodeposition (to accompany an exhibit of Electroplating), but also what was perhaps of most universal interest, a discussion on Chemistry and Food Science. SIR FRANK SMITH being unfortunately able to attend, DR. LAMPITT delivered a short introduction, as well as his paper on "The Scientific Aspect of the Preservation of Food." DR. LAMPITT warned his audience against becoming over-scientific; a great deal was heard of the value of sterility in food, yet a meat pie which was absolutely sterile would be utterly flat and tasteless. The aesthetic side, from the point of view of both taste and appearance must be considered. Another danger was the threatened loss of art in food preparation; whereas the food chemist spent years in working out a formula to make certain changes in, say, dough absolutely regular, the cook, by a deft movement of the fingers, could achieve the same change through the age-long tradition of his craft. Still, the food chemist had done much to counteract many forms of deterioration, though there were many problems yet to solve. DR. L. J. HARRIS dealt with the nutritional aspect, and proved conclusively that dietetics was now becoming an accurate science; standards of reference by new chemical and clinical methods now offering themselves for determining diet deficiencies. DR. KIDD's paper on the biology of food preservation (read by DR. MORAN) led up to MR. T. M. HERBERT's description of modern methods of food transport, by sea, rail, and road. Chemical and physical research had contributed largely to the possibility of feeding large industrial communities with food transported in cold storage. A very varied scale of temperature was demanded for varied commodities, the banana especially requiring elaborately graded heat conditions. A lively discussion followed, headed by SIR JOSIAH STAMP, who insisted on the importance of accurate terminology in a subject so vital to everyone as that of nutrition.

In Section A (Mathematical and Physical Sciences)

some little stir was caused in lay circles by the "recantation" on the part of SIR JAMES JEANS, who abandoned the theory that he had held of the formation of the solar system. On mathematical grounds it appears unlikely that the drawing-out from the sun of the material now represented by the planets was caused by the approach of another star; an actual collision is demanded. The presidential address, "Trends in Modern Physics," by PROFESSOR A. FERGUSON was of great significance.

### "Comfortable Assurance" Gone.

The comfortable assurance of 19th century physicists exists no more. The analysis of the last few years, which is essentially mathematical, has introduced the notion of probability into our estimates, say, of position. We describe the wave which accompanies a corpuscle by means of an equation which will contain an expression for the amplitude of the wave; and the amplitude at any point gives us a measure of the probability of finding the corpuscle at that point; if the amplitude vanishes anywhere the probability of finding the corpuscle at that point vanishes also. The concept of an electron as a definite entity at a definite point in space is replaced by a probability pattern which, very dense in a certain locality, rapidly thins as we move away from that locality. In fact, if we fix our attention on the densest part of a given pattern, the probability of finding an electron at a distance of  $10^{13}$  cm. therefrom becomes vanishingly small, and most of us may be content to use the concept of an electron almost in our accustomed manner, realising that it has become a little fuzzy at the edges.

Whatever the form of the picture the hard-pressed physicist of to-day remains on firm ground if he refuses to confuse the concept—the world-picture—with the percept; if, making this distinction, he studies the question of the reality underlying phenomena as philosopher rather than as physicist; if he is as ready to discard outworn models as ever Maxwell was. There is no finality in these matters, and solutions of these difficulties are solutions for a day; but it is interesting and heartening to know that Planck, the initiator of the movement which has revolutionised physical thought, has, a generation later, pointed a way to a resolution of the fundamental doubts and difficulties which his genius has raised.

Space forbids the treatment of more than a few of the fascinating problems discussed, and a purely arbitrary selection has been made of some of the papers of outstanding interest.

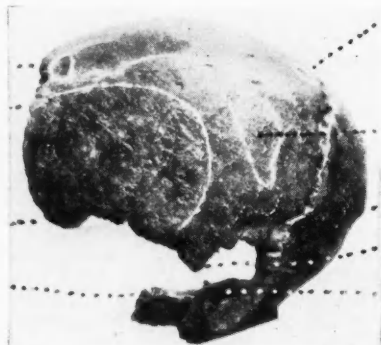
For the ensuing year SIR EDWARD POULTON, F.R.S., has been chosen President.

## The Swanscombe Skull.

By E. N. Fallaize.

*An announcement at last year's meeting of the British Association that a portion of a fossilised human skull had been found by Mr. Alvan T. Marston at Swanscombe, Kent, seems to have received less attention than it merited. A further discovery since that date now makes it possible to gauge more accurately the importance of the find.*

THE Swanscombe skull, the discovery of which by Mr. A. T. Marston is of great importance in the study of early man, is, like most others of its kind, in a fragmentary condition. Two bones only have been found,



[From "Nature" by courtesy of Mr. A. T. Marston]

Left lateral view of the Swanscombe skull.

*a*, Anterior oval depression. *b*, Posterior round depression. *c*, Temporal line. *d*, Muscle attachment above and behind temporal line, perhaps for origin of functional ear muscle. *e*, Basilar process. *f*, Foramen magnum, filled with plasticine to support skull. *g*, Inverted antero-inferior angle of parietal bone. *h*, Everted postero-inferior angle. *i*, External occipital protuberance.

but both are in a remarkable state of preservation. Not only do they give a complete reconstruction of the back part and the left side of the skull, but the occipital bone retains all the parts of the lower portion, which are usually missing in early skulls, including the foramen magnum, the aperture through which the spinal cord enters the brain case, and of which the position in the base of the skull makes it possible to determine the carriage of the head and to say how far any given type of hominid has advanced towards the upright posture. Further, as the margins of the two bones are intact, a number of measurements of importance to the anthropologist can be made with accuracy, instead of being estimated on a conjectural reconstruction, as so frequently is necessary when discussing the relation and affinities of early types of man from fossil evidence.

The state of preservation of the bones and their completeness is, of course, a matter of great technical interest, which is of the first importance in determining the position of the skull in the scale of human development, and in deciding its affinities with other forms. The significance of the find, however, will be even more readily and generally appreciated from the place in the chronological scale to be assigned to it on the evidence of the circumstances of discovery than from its phylogenetic relation to other types of fossil man.

The first bone, the occipital, was found by Mr. Marston, in June, 1935, at a depth of twenty-four feet below the surface in the middle gravels of the Thames 100-foot terrace, as already mentioned, at Swanscombe, Kent. These gravels are already famous in the annals of archaeology, and both at Swanscombe and in the neighbouring area of Northfleet have produced an imposing assemblage of flint implements of the earlier phases of the Palæolithic Age. Many of these are remarkable examples of the flint worker's art. The occipital bone now under consideration was associated with implements of Acheulean type, the second of the major divisions of the culture of the Palæolithic Age.

The further discovery, that of the left parietal bone, was made in March, 1936. This bone was found at the same depth as that of the earlier discovery and in the same seam of gravel. It was photographed while still *in situ*; and the conditions in which it was found cannot be disputed. Nor can there be any question as to its anatomical relation to the first find. Its evidence confirms the stratigraphy, and therefore the dating of the first bone, while this in turn reciprocally fixes the cultural associations of the second bone. The two belong to a single skull, and this is of Acheulean age.

Naturally in view of the form of the skull, which is essentially primitive, and its early dating, the first question to present itself is how does the new find stand in relation to the Piltdown skull (*Eoanthropus Dawsoni*), hitherto regarded as the earliest in form and date of the skulls of early man found in Britain. It will be remembered that the evidence relating to the dating of Piltdown man was ambiguous. The fragments from which the skull was first reconstructed were not found *in situ*, but among excavated gravels, which were either pliocene or pleistocene in origin. The

cultural evidence—some eoliths and a somewhat indeterminate bone implement—was not conclusive. The question whether Piltdown man was to be assigned to the earlier or later date became relatively of secondary importance in view of the significance of the skull as an example of a remarkable and primitive type, then holding a unique position in the evolutionary scale. Unquestionably older than any known example of Neanderthal man—unless the Heidelberg jaw is to be regarded as belonging to a primitive form of that group—it offered the apparently anomalous association of a brain case, primitive indeed, but in certain characters of a generalised type approaching the line of modern man, with a jaw so chimpanzee-like in character as to have been rejected for long by many as not belonging to the fragments of skull, with which the reconstructions associated it. Later discoveries, however, and further study pointing to a group of early generalised types, which would include with Piltdown man such forms assigned to the early Pleistocene as *Pithecanthropus* from Java, and Peking man, and with some reservations as to its dating, the Kanam skull discovered by Dr. L. S. B. Leakey in Kenya, tended to confirm an early dating for Piltdown man also.

#### Lower Jaw May be Found.

These, though matters of past controversy, regarded as settled, must now be borne in mind in discussing the bearing of the new evidence upon the problem of early man, and in order to determine the place of the Swanscombe skull in type and time.

The absence of the jaws and teeth from the Swanscombe skull is regrettable, as these are among the most marked characteristics of Piltdown man, pointing, as does the evidence of the lower part of the face in Rhodesian man, to something of a lag of the face and especially of the jaws and teeth in the evolutionary process. If, however, as is not beyond hope, the lower jaw should be found, the point of interest to be noted will be whether it presents any sufficiently close affinity with the jaw of Piltdown man to justify its inclusion within a common grouping.

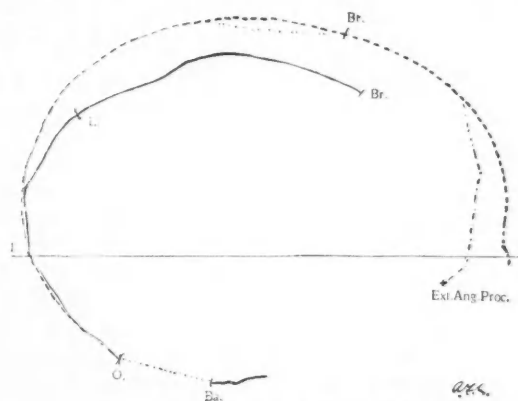
Pleasurable as such anticipatory speculation may be, it must be set aside for consideration of the facts as we have them. Without entering too deeply into technical detail, it may be said that the anatomical features of the Swanscombe skull are such as definitely to give it a more primitive status than that of Piltdown. It is less advanced, but still of the same general type. In a comparison of the two skulls, Mr. Marston says (*Nature*, August 1st, p. 200) that the Swanscombe skull is lower in the vault, and the slope of the parietal bone downward and outward is more pronounced than in

Piltdown man, while the parietal covers more of the frontal and temporal regions of the brain. These, with other characters, which he has noted in the technical description of the skull, mark a definitely closer approach to a more generalised and primitive type than is to be observed in Piltdown man. And a similar inference is to be drawn from certain variations in the characteristics of the brain of Swanscombe man, to which he directs attention as deduced from the markings on the cast which has been made from the interior of the skull.

On the morphological argument, therefore, the conclusion is justified that while the Swanscombe skull, so far as present evidence goes, belongs to the same general type as Piltdown man, it represents an earlier and more generalised form of that type. Though by no means conclusive, this may be taken as strong presumptive evidence that the Swanscombe skull is also chronologically the earlier, in view of the absence of conclusive geological or cultural evidence for the dating of Piltdown man, and notwithstanding the assignment of that relic to Pliocene or early Pleistocene by many authorities.

The association of Swanscombe man with Acheulean implements seems to be unquestionable; and the character of the implements, as belonging to early phases of that culture, has been vouched for by that great authority on the Palæolithic age, the Abbé Breuil.

If then the argument be accepted, and at its full implication, Piltdown man must be assigned to the later of the dates, which hitherto has been regarded as possible, though not probable, and regarded as in any case later than the form of Acheulean implement associated with Swanscombe man, while to this individual



[From "*Nature*" by courtesy of Mr. A. T. Marston.]

Sagittal contours of Piltdown (Elliot-Smith) and Swanscombe superimposed so that the inion and opisthion coincide. (Swanscombe: full line. Piltdown: interrupted line.)

must be assigned the honour of being the most primitive, and probably in the chronological sense the earliest, type of man to be found in Britain.

In this connection, however, it may not be out of place to mention certain views which have been put forward recently on the relations of these early generalised types to the modern races of man. Dr. Weidenreich, Director of the Chinese Cænozoic Laboratory, Peiping, has pointed out that the modern Mongols, in certain characters, more especially in the jaws and teeth, bear a resemblance to Peking man, although the intermediate types which might form connecting links are as yet not known. Sir Arthur Keith, too, has arrived at a similar conclusion, and indeed, has carried the argument further. In his recent Presidential Address to the British Speleological Association at Buxton in July last, not only did he urge that the view that the white, black, brown, and yellow modern races were evolved from a common ancestor of mid-pleistocene age was no longer tenable, but he also went on to maintain that the characteristics of the Australian, the Mongol, and the African negro were already to be observed in *Pithecanthropus* from Java, in Peking man, and in the East African Kanam skull respectively.

Although there were admitted gaps in the evidence, Sir Arthur considered that it justified the conclusion that the ancestors of the modern races, the Australian, the Mongol and the African, at the beginning of the Pleistocene were already in occupation of the continental areas their descendants now occupy and that after their separation each race underwent a series of parallel evolutionary changes in teeth and jaws, brain and other features showing simian affinities. "Throughout the Pleistocene period," he said, "the separated branches of the human family appear to have been unfolding a programme of latent qualities inherited from a common ancestor of an earlier period." It will be gathered that Sir Arthur here approaches very nearly to the hologenetic view of human evolution in which racial characterisation is regarded as the differential development of latent potentialities.

A further question must be mentioned here, though briefly, as it serves to reinforce a point bearing on the method of chronological argument raised by the evidence of the Swanscombe skull. Sir Arthur relied upon the evidence of Solo man, discovered in Java in 1932, as an essential mid-Pleistocene link in tracing the Australian back to the early-Pleistocene *Pithecanthropus*, or Java man. Since he wrote, Dr. P. van Stein Callenfels, a distinguished Dutch authority on the archaeology of the Far East, has pointed out that harpoons and axes of staghorn found with Solo man and apparently beyond question contemporary with the human relics, are of the

type found in Europe with Azilian and Forest cultures of Mesolithic times, and of a late form, which cannot be older than nine or ten thousand years—certainly not of an antiquity which would be reckoned in hundreds of thousands of years as on a mid-Pleistocene dating. Should further consideration approve the validity of Dr. Callenfels' argument, with all its reservations, this would afford another instance of a skull of a very archaic type relegated to a comparatively late date, as in a lesser degree now appears to be necessary in the case of Piltown man, and also, some authorities would hold, in the case of Rhodesian man. The possible survival of these early types to a late date makes of human evolution a much more complex process than has generally been held, while phylogeny, as at present understood, which traces the evolution of man in an ordered line of descent from early to late forms, however valuable as a logical system of classification, is shown to afford a very uncertain guidance as to relative chronology.

#### A New African Anthropoid.

Since the above was written, news is to hand of an important discovery in South Africa which is of special interest in connection with the theory put forward by Sir Arthur Keith. In July last, Dr. Broom, of the Transvaal Museum, Pretoria, identified in the material from a blast in the caves at Sterkfontein, near Krugersdorp, the greater part of a cast of the brain, a number of fragments of the skull, and several teeth of a fossil anthropoid ape of a new type. It is stated in a communication from Dr. Broom, which appears in *Nature* for September 19th, that the skull presents a number of characters in which it resembles man, but which are not found in the living anthropoids. One of the teeth, the first molar, which is exceedingly large, agrees fairly closely with the first molar of the fossil ape *Dryopithecus rhenanus*. This ape, which is one of the largest of the fossil apes and was found in the Pliocene deposits of Central Europe, is regarded by some palæontologists as very near the line of descent of man. Although the new South African fossil presents a generic resemblance to Prof. Dart's Taung's skull (*Australopithecus*), Dr. Broom regards it as specifically differing from it; and it seems to be later, probably belonging to the Upper Pleistocene, whereas the Taung's skull is either Lower or Middle Pleistocene. Being adult, however, it serves to confirm Prof. Dart's conclusions, which had been questioned on account of the infantile character of *Australopithecus*, that his fossil anthropoid is not closely allied to either gorilla or chimpanzee, and is on or near the line by which man has arisen.



## The T - I - M Clock

By Doré Silverman.

*Nowadays the public is apt to take for granted even such a marvel as a clock which will answer questions on the 'phone. This article that shows the principles embodied in the mechanism of the new Post Office "talking" clock make it an outstanding product of modern ingenuity.*

A FEW months ago an attractive girl named Jane Cain stood in front of a microphone in a Shepherd's Bush laboratory and chanted "Ten—twenty—eight—four—thirty—six—ten—forty—fourteen—twelve—twenty—two. . ." Next, she devoted herself to odd numbers, "—twenty-three—thirty-five—seven—one—nine. . ." "On the third stroke," she went on, "on the third stroke, it will be, it will be . . . on the third stroke it will be. . ."

She was not being tested for a part in a film, nor was she taking part in a new parlour-game. The recital was part of the preparation in the manufacture of the "talking-clock" from which, merely by dialling T-I-M, every telephone user can now learn the exact time.

What she said was recorded on a number of glass discs and it is from these discs that telephonic enquiries are answered. Glass was chosen for the records because they had to be transparent, and because glass is the most durable of things that can be seen through. They are one-eighth of an inch thick. These discs are the first of their kind to be made, and are the work of an Anglo-Hungarian scientist named Wender. The method of their construction is a deep and closely-guarded secret, but even were it to be disclosed in full, it would have to be in a scientific jargon which not one man in a hundred would understand. Many days and many nights were spent in research, experiment and trial in the laboratories at Shepherd's Bush before satisfaction was obtained.

A special camera, the only one of its kind in this country, was built to photograph the sound and cadences of Miss Cain's voice. The sound-tracks resulting were recorded on discs. Each track, each groove in them, consists of disjointed parts of a sentence, like those in

the first paragraph of this article. An intricate mechanical system selects words which give a coherent sentence, stating the time at the moment of your enquiry. Thus, "At the third stroke" is taken from one groove, "it will be" from another, "eleven o'clock" from another disc, and the sound "pip-pip-pip" from a fourth.

Part of Mr. Wender's secret lies in the automatic gearing which selects the necessary tracks whose assembled words form a coherent statement, giving the time every ten seconds during the twenty-four hours of the day. The discs are driven by mechanism at a controlled, regularised speed by a synchronised motor, much like that of an electric clock; and four is the minimum number of discs sufficient to

make the scheme workable. The clock, except that it has a pendulum, has none of the features of the ordinary clock. Indeed, it has no features!

It consists of a pendulum in a grandfather-clock-case, placed behind what looks like a collection of spare parts from half-a-dozen motorcars and the components of a number of radio-sets.

When you dial T-I-M you set in motion a series of events. You are automatically connected with the clock in the same way as you are with the switches at any other exchange. You are allowed to listen to the time announcement for a period of from 90 to 180 seconds, at the end of which a force-release of the call comes into operation.

Speech is reproduced from the discs by focussing a beam of light on to one of the tracks and allowing the light which passes through to fall on to a photo-electric cell. This produces an electric current which may be



Miss Jane Cain, whose voice the "talking" clock employs.



hourly by a signal from Greenwich. Should this not arrive when the clock-mechanism is in the exact position corresponding to the hour, one of a number of relays, depending on the magnitude and sign of the error, is operated.

The operation of the relay causes the current in the coil of the magnet, below a small armature carried by the pendulum, to be varied appropriately. The attraction between the armature and the coil constitutes a small force on the pendulum, additional to gravity. By variation of this force compensation for slight changes in the pendulum rate is obtained.

The accompanying schematic diagram is even more lucid—if you speak the language.

The talking-clock is installed at the Tandem Exchange building in Holborn. In effect, it constitutes an additional exchange. Its construction and operation permits its serving as many people as are likely to want to know the time at any given moment—actually some two hundred callers can be answered simultaneously by the clock. Should the twenty-four hour clock ever be introduced into this country, the talking-clock will be easily adaptable.

## March of Knowledge.

Eighty fossilized bones of an iguanodon have been discovered in a quarry at Wittersham, near Rye. They were recovered from ironstone, at a depth of 7 feet. They have kept their shape perfectly, the surface markings and marrow-channels being clearly distinguishable. Close watch is being kept for the skull, which is thought to be still buried in the quarry-face. The fossils included 12 caudal vertebrae, several larger vertebrae, portions of ribs set in matrices of ironstone, two distal ends, and many fragments and portions of ribs. The large vertebrae are 9 in. in diameter. The length of the specimen is estimated at 30 feet.

The existence of a higher chloride of manganese, probably  $MnCl_3$ , has often been reported, but its existence in the pure state has only recently been demonstrated. The trichloride has now been obtained as a brown crystalline mass by acting upon manganic acetate,  $Mn(C_2H_3O_2)_3$ , with liquid hydrogen chloride at  $-100^\circ$ . A violent reaction occurs, and an olive-green liquid is produced. This is evaporated to dryness at the same temperature. The solid may be heated to room temperature in a closed vessel with little decomposition. On heating, it evolves chlorine and leaves a white residue of manganous chloride.

Measurements of the temperature at the precise plane of division between sliding surfaces, lubricated and unlubricated, have been made by F. P. Bowden and K. E. W. Ridler, of Cambridge, with a method invented by Herbert depending upon the thermo-couple current.

They have measured the current given by their arrangement and find it often corresponds to a temperature of 1,000 deg. C. Thus in machines whose main parts stay cool the temperature at the recise surfaces of sliding may be nearly that of the melting-point of iron. Even when the sliding surfaces are lubricated with a first-class oil they may register temperatures of 600 deg., far above the melting-point of lead.

The first busy road junction in the country to be equipped with invisible ray apparatus, to enable pedestrians to cross the roads in safety, is to be that which is formed at East Ham, London, by Romford Road, Rabbits Road, and Manor Park. Work will begin shortly on the erection of automatic traffic signals, which will be operated by vehicles, but which, so far as pedestrians are concerned, will be controlled by invisible ray apparatus. This is now superseding the system whereby pedestrians, by pushing a button, could hold up the traffic while they crossed.

The 25,667 ft. Nanda Devi, a hitherto unscaled peak 200 miles north of Lucknow, was carried by assault on August 29th, by Mr. W. H. Tilman and Captain N. E. Odell. The closing stages of the adventure were fraught with unexpected difficulties. During the final days the British and American climbers worked entirely alone, handicapped by the fact that the Mana porters had returned earlier and their Sherpa porters had failed them owing to illness, which resulted in all of them being returned to the base camp. A severe blizzard delayed higher operations for three days. Nanda Devi is the highest peak in British India.

## The Film and the Choice of a Career.

MANY and varied results and far-reaching effects are the outcome of visual education through the kinematic medium. A new and hitherto unconscious part of the mind is developed by the acquisition of knowledge through the eye; consequently the mind is not only relieved of a certain amount of strain, but becomes more alert, richer and more powerful. In the young a wider knowledge brings a clearer conception of the difficulties of the life before them.

The choice of a career is a problem which is often tackled by a quite young child. Most boys have had at some time a definite urge to become an engine-driver, drive a dustcart, be a coal man, and even grind an organ. The reason why these occupations appear most attractive to small boys is twofold: first, because their undeveloped imagination has been fired by seeing these occupations, which in their apparent simplicity they feel they could tackle; and then because the very young as a whole get no opportunity of realising that other occupations exist. As children grow older, their minds broaden and change, and the engine-driver and his many attractions vanish from their consideration. But there is no substitute, and the adolescent very often finds himself in a stage of indecision, where kindly and intelligent suggestions fail to kindle any real response. The suggestions have not appealed strongly enough to convince, and the imagination has not been stirred. The problem is a real one which grows every year for both the adult and the child. Stirring the imagination is only the beginning.

In America an attempt has been made to lessen this difficulty by producing a series of films, "Secrets of Success." Each of these films shows the life that is led by those pursuing various careers, and the mentality and personality which go to make up the people choosing these careers, varying from domestic and manual labour to business, scientific, or artistic occupations. This is of real use and help as far as it goes, but it can be pursued still further. Thus far the young men or women can discover an undreamt of variety of occupations they can find out about themselves, by seeing others (whom they resemble) doing things they had never envisaged.

Films are now being made and distributed which show in detail the beginning, the development and the completion of almost everything that is begun and completed by human efforts. The young man or woman, boy or girl, seeing these developments for themselves, can see also the advantages and disadvantages and are therefore more easily enabled to come to a final decision, or at any rate to discuss the most important step in their lives with some confidence.

## Letters to the Editor.

### FACES ON FONTS.

*To the Editor of DISCOVERY.*

Sir,—If any of your readers happen to know of any ancient fonts in their neighbourhood that are decorated with masks, faces, or heads (as distinguished from sculptured figures of saints or angels), I should be greatly interested to receive particulars about them. I am endeavouring to trace the origin, development, and significance of this type of ornamentation.

Yours faithfully,

H. SANDERSON STEWART.

Malvern, Worcs.

### DOWSING FOR CAVES

*To the Editor of DISCOVERY.*

Sir,—Mr. Maby's letter in your August issue of *DISCOVERY* interested me greatly and reminded me of a case which probably contributes nothing to the study of the divining rod, but may entertain some of your readers as a story. A personal friend of mine out here in Yugoslavia, headmaster of a secondary school, interested in natural science, and a member of the local Cave Research Society, has the gift of locating caves by means of a divining rod. In connection with this I was told the following:

During the war the Austrian forces on the Karst front depended for both water and shelter very largely upon the numerous caves of that region. For this reason, members of the Cave Research Society were attached to military units in order to assist them with their local knowledge of cave openings. On one occasion, during a violent bombardment by the Italians, the officer in command of the certain position in the Karst was extremely anxious to shift the field hospital to a place of safety. A cave would have been a godsend, but there was no known opening anywhere near. Finally, a soldier came forward and very diffidently and with much trepidation explained that one of "the professors" was supposed to be able to find caves "with a crooked stick." To the officer this statement made no sense, but in default of more matter-of-fact counsel Professor P. X. was summoned, asked whether he could really locate caves by occult means, and ordered to exercise his art. Professor X could only say that he could not account for it, but that the divining rod had repeatedly dipped in his hands when there was a cave underneath, and he fervently hoped it would do so now. By then the position was becoming desperate and the field hospital was in imminent danger. So the sceptical officer bade the professor provide himself with the necessary type of stick and hurry up and "find a cave." This part of the order was not so absurd as it seems, because the Karst is honeycombed with caves, only they are not always open to the surface, and there may be some distance between one cave and the next. The professor took his divining rod, prospected about, and finally, to everybody's intense relief, the rod dipped. He recommended excavation at that spot, pointing out, however, that he could not guarantee the size of the cave located by divination. Luck was on the side of the Austrians. Earth and stones were removed, a roomy cave gaped below, and the wounded were taken to shelter underground in the nick of time.

Yours faithfully,

F. S. COPELAND.

Split, Yugoslavia.



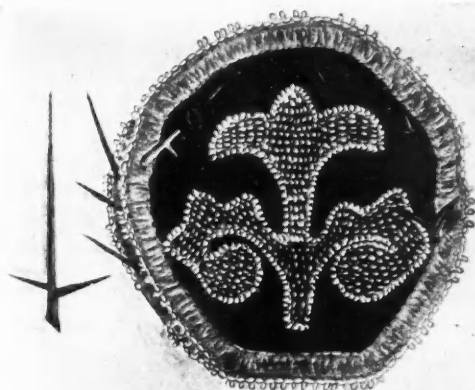
# Pins.

By Voilet M. Methley, (F.R.Hist.S.)

*The expression "for two pins"—shows how we belittle this useful object. This article shows that pins were formerly highly prized, and were often elaborately worked and embellished even from Neolithic times.*

LIKE Mrs. Stowe's immortal "Topsy," the first pins were not man-made: they "jus' grewed." Skins or fig-leaves, used as garments, needed something to secure them and thorns served this purpose, serve it still, indeed, with some backward or conservative people. Bead-embroidered thorn-cushions, instead of pin-cushions, survive amongst certain North American tribes. Even in England gypsies use "pin-thorns" to fasten shawls or tent-flaps: these are long spines from the early growth of blackthorn, hardened by boiling in fat. The very word "pin" is probably derived from the Latin "spina," meaning a thorn.

In places or at seasons where thorns were not available our ancestors used bones or splinters of bones from



*A pin-case of the Musquakie Indians of North America. (Size  $3\frac{3}{4}$  in. square.)*

fish or animals killed for food, at first almost in their natural form. But even in the paleolithic period of the Stone Age vanity persuaded utility to smooth and polish these bone pins, rounding and shaping their heads, and even, a little later, carving them into various devices.

When a new Age introduced worked metals, pins of real beauty were made from iron and bronze. Specimens of these are possessed by many Museums: they survived the fate of every generation's innumerable lost pins mainly through being used for funeral purposes, probably to secure the shrouds of the dead, or the clothes in which their ashes were collected. Pins have been found in British and Celtic barrows, as well as Saxon burial-grounds and even until a much later date they were thus employed as ecclesiastical brasses and monuments of the fourteenth and fifteenth centuries plainly show.

The pins of the Ancient Greeks and Romans were of beautiful workmanship and sometimes very large to secure adequately the thick and complicated folds of draperies. Fine gold and jewel-set pins of this kind have been found belonging to the Homeric Age, about eight hundred years B.C. Some fourteen centuries later, Herodotus relates how certain Athenian women employed their stiletto-like pins so effectively as offensive weapons against a citizen who had offended them that they were forbidden to wear these objects, and forced to adopt the fashion of dresses sewn together or fastened with small brooches.

These immensely long pins were probably also used for the hair both by men and women; two-pronged hair-pins were not introduced until much later. Patriotic Athenians, before the Persian wars, wore grass-hopper-headed pins to secure their hair, for this insect was believed to be generated directly from the soil of Greece.



*A Jacobite pin-cushion, showing the names of the leaders, generals and men who died for Prince Charlie and the Cause. (Size  $3\frac{1}{2}$  in. by 3 in.)*

Votive pins, with the emblems of gods or goddesses and dedicatory inscriptions have been found in or near temples; possibly they were given for use in religious ceremonies.

It is noteworthy that almost all types of ornamental pins fashionable now were known in ancient times. Pictish craftsmen made them of the shape called, in England, scarf or tie-pins, and in the United States, stick-pins: Iron Age ladies wore those double pins connected by a chain which graced the cravats of Georgian gentlemen; the safety-pin and fibrula shapes, from which all later brooches have evolved, were in everyday wear amongst many prehistoric races. For beauty of design even modern jewellers go to the most antique models for inspiration.

The modern pin of everyday use multiplied exceedingly in numbers as dress became more and more complicated. Saxon and Norman women needed comparatively few pins, but from Plantagenet times onwards immense quantities were required to secure the wimples, veils, lappets, kerchiefs, and horned, peaked and turreted headgear of fashion. Jehan de Meung, in the *Roman de la Rose* declares that "about half a dishful of pins are inserted about the horns and round the wimple," so that this "seems nailed to the neck and the pins stuck in the very flesh."

These numerous pins were still often made of very fine splinters of wood or bone, for metal pins were for long an extremely expensive luxury, even in England where the Pinners or Pinmakers counted as an important craft early in the 14th century, and by the middle of the 15th contributed as many as twenty men to the City Watch.

That English pins were prized is shown by the fact that, in 1400, Jehan le Breconnier, pin-maker of Paris, supplied the Duchess of Orleans with five hundred

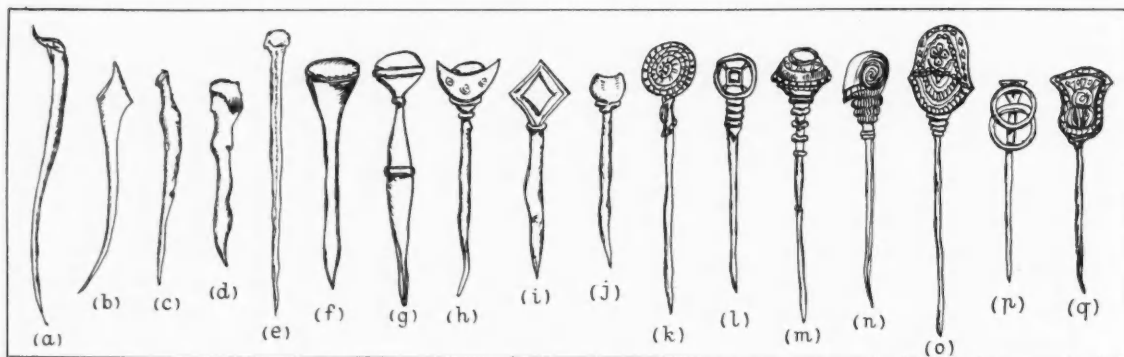
"English-made" pins as well as with several thousands apparently of inferior quality.

Pins at this time are constantly mentioned as one of the dominating articles in a trousseau. Twelve thousand were issued from the royal wardrobe to complete the wedding outfit of a French princess in 1347, and an ancient tax was imposed in France to provide the Queen's pins.

By the end of the 15th century French competition had become sufficiently strong to make legislation necessary to protect the rights of English pin-makers. An act of 1483 prohibited the importation of pins, but it seems as though this must have been disregarded, for under Henry VIII another attempt was made to keep second-rate pins out of the country. No pins may be sold, says a statute of this reign, unless "double-headed, with the head soldered fast to the shank, well smoothed, well shaven, the point well filed, cauted, and sharpened."

Before this there had been laws to restrict the sale of pins: they were allowed only in open market on the first two days of the year, when there was a rush to buy them, which must have equalled the January sales of our own days. It is from this period that the term "pin-money" has survived, because a cash sum to buy pins was a usual and most desirable New Year's gift, and the phrase was soon also used to cover the whole dress allowance made by husbands to their wives.

Notwithstanding all this, foreign pins still continued to flood the English market: witness the piteous complaint to Lord Burghley from the Pinners at the end of Queen Elizabeth's reign. After complaining that £40,000 worth of pins and needles were yearly imported, "nothing so good or well wrought as those are which are made within the land," the petitioners proceeded to bring forward two pleas in favour of a tariff barrier



(a) Pin-thorn; (b) fishbone pin, and (c) to (e) bone pins, all of Paleolithic period, c. 3,000 B.C.; (f, g) Neolithic bone pins, c. 2,000 B.C.; (h to j) Celtic bone pins, found in burial burrows; (k, l) Celtic bronze pins, c. 1,000 B.C.; (m, n) Gold pins, Greek, c. 800 B.C.; (o) Gold and Jewelled pin from Pompeii, showing ornate workmanship of the decadent period c. 200 B.C.; (p, q) Saxon bronze pins, the latter embellished with garnets and turquoise.

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which echo in ears of to-day with a strangely familiar sound. They argue that "the restraint of bringing them in will be the means of setting many thousands of our poor to work who now, being idle, perish and miscarry." And it is suggested further that "lame soldiers, though they have not legs, may work on that trade." Things went on from bad to worse, however: at the beginning of the reign of James I the country was purchasing foreign pins at the rate of £50,000 worth a year, which, even if needles should possibly be included, is a startling sum enough.

According to a theologian of those days this excessive pin-consumption spoke well for feminine manners, for Besson calls pins "the thorns of Christian roses, invented by pure women solely as a means of modesty." Jehan de Meung had supported this view indirectly at an earlier date when he protested that "one must not admire these fastenings of their garments too close, for the pins sting worse than nettles or thistles." Later, Pepys, as he relates in his diary, experienced a similar prick from one of these "thorns" when he made amorous advances to a pretty girl in church, whereupon she "did out with a pin" to repel him.

Now, at last, a definite and successful attempt was made in England to recapture the pin-trade. In 1625, a Gloucestershire man, John Tilsby, founded the first real factory. Up to now pins had been made by individual craftsmen using a small bone implement, on the flat surface of which was a series of inch-long grooves, deep at one end, but tapering towards the other. This tool served to file the pins to a point, its formation making it possible to shape several at one time from lengths of wire. Many of these "pin-bones" still exist, having been found, in London and elsewhere, chiefly amongst the residuum of Tudor times.

#### Seven Men to a Pin.

Now methods more adapted to mass production were adopted, although the details connected with pin-making still necessitated many distinct workers. Much later than this Adam Smith pointed out that it took fifteen people to make one common pin, and Elizabeth Barrett Browning developed this idea further in "Aurora Leigh," when she writes:—

"Twill employ  
Seven men, they say, to make a perfect pin;  
Who makes the head content to miss the point:  
Who makes the point, agreed to leave the join:  
.....  
Seven men to a pin—and not a man too much!"

English-made pins soon acquired an enviable reputation: the heads—still made separately—were attached to the shank more firmly than was the case with those of

foreign extraction. Indeed, in 1775, American Congress offered a prize of £50 to anyone who produced twenty-five dozen pins of home manufacture equal to those from England.

The style of women's dress initiated in Queen Anne's reign necessitated a vast number of pins to keep in place the pinnners and lappets, the bands, frills, and furbelows, not to mention the pleated intricacies of the fashionable "fontange" head-dress. No wonder that a preacher of the time said: "Ladies, less time is given to clearing a stable holding four horses than you employ in sticking all your pins into your ribands and laces."

Whilst Pope, in the "Rape of the Lock," tells how: "Files of pins extend their shining rows."

Yet, in spite of the enormous demand for these small necessities it was not until just after the accession of Queen Victoria that the machine was invented which turned out pins manufactured from brass wire all in one piece with solid heads.

#### "Étincelles" for Belles and Beaux.

In 1824 and later there was a great vogue for "étincelles": which is to say, steel pins headed with tiny brilliants. These were set in the folds of the voluminous "pouter-pigeon" cravats worn by the belles as well as the beaux of that day, or sparkled amongst the short "Brutus" curls of regency mock-classical beauties.

Meanwhile, there was that growing fashion for elaborate masculine scarf-pins of gold set with precious stones, which lasted well into the 20th century.

But it is the common or garden domestic pin, and not these aristocrats of its race, which has played, in its day, a humble part in history as well as art. That was a tragic pin which pricked out one of the last letters written by Marie Antoinette in the prison of the Conciergerie only a few weeks before her execution. Failing pen or pencil, this note to the friends outside who were planning her rescue, in answer to a message sent amongst the petals of a bunch of carnations, was pricked on a slip of thin paper in the following words: "Je suis gardée à vue, je ne parle à personne, je me fie à vous, je viendrai." The pin-pricked note miscarried, the conspiracy failed; but twenty years later there were other pins which played their part in making French history. Around 1817 there flourished *sub rosa* the secret society which concocted the "conspiracy de l'épingle noire." All the members of this pact wore a black pin as a sign to fellow-conspirators.

Even before this pin-cushions had played their part in political propaganda. A mock-serious pamphlet issued in Manchester during the year 1745, advises the Whig magistrates of the north to keep their eyes on the pin-cushion-makers, who "should be rigorously chastised

and their works publicly burned, let the pretty misses cry as loud as they will. It is a monstrous shame that such an ancient necessary appendage to the ladies' toilet should be thus Jacobitised and transformed from its primitive use into a variegated tool of faction and sedition." These "Jacobitised" pin-cushions, of which some still survive, must have been secretly made in the Highlands or possibly in France, for the treasonable mottoes and emblems are often not merely embroidered, but woven into the fabric. Such are the pin-cushions of Stuart tartan, itself forbidden wear, surrounded by a band on which is inscribed phrases like, "God bless P.C.," "Down with the Rump," "God Keep King James," and so on. To these are attached tartan ribbons, so that they might be flaunted at the waist-belts of Jacobite maidens. Others, a shade more discreet, had their seditious inscriptions executed with pins only, which could be easily obliterated or altered by sticking them in after some different pattern.

#### A Pathetic Pin-Cushion

A more pathetic pin-cushion is that of a rather later date upon which is recorded, printed upon cream satin, the roll-call of those who fell in the Jacobite cause during the ill-fated rebellions of '15 and '45. In the centre of each side of this square, dark-blue tasselled pin-cushion is the traditional White Rose of the cause, with, around it, the words: "Mart. for K. and Con.," that is to say: "Martyred for King and Country."

Surrounding this inscription in a circle are, on one side the titles of leaders, such as Derwentwater and Balmerino, with the names of the men who died; on the other side, in the same way, are inscribed the names of fallen esquires and captains.

One pin-cushion of this defiantly treasonable kind has a curious history. It was enclosed in a box with a note declaring the writer's intention not to open it until "King James III comes to the crowne." On the lid of box was written: "It is a forfeit to open this Boxe for fere of your Eyes, for it will blinde you." This terrible threat prevented the box being opened by the descendants of its first owner for more than a century.

Pin-cushions over a hundred years old are still to be found bearing in rusted pins initials and mottoes suited to the bridal couples or the expected infants for whom they were intended. Sometimes elaborate patterns of flowers and scrolls are exquisitely worked-out in the pin-heads of different sizes, with symbolic cupids and true-lovers' knots. These "pinscriptions" commemorated, too, the ending of life as well as its beginning: epitaphs in pins find a place upon memorial cushions of black velvet or purple satin; sometimes even a portrait of the deceased is outlined in pins.

More elaborate portraiture is found in another aspect of pin-art. All must remember having, in youth, executed pictures by means of stitches in wool over pin-pricks in a prepared outline, sometimes enriched with chalks. But our foremothers were not content with such crude and childish efforts. Pin-pricking with them was a fine art, with an elaborate technique of its own, as may be read in the instructions given in a *Manual of Elegant Recreations, Exercises and Pursuits*, which dates back more than a century and a-half.

From this we learn that pricking pictures with pins was an "Agreeable Accomplishment," carried out with pins of various thicknesses, to produce lines sometimes microscopically fine.

The paper to be pricked was laid upon a flat cushion, or several folds of cloth and punctures made both from the back and face of the picture. Pricking from the front, it seems, produced the bolder outlines, which were then filled in from the back, with tiny dots made by an extremely minute pin.

Sometimes the faces, hands and feet of figures were tinted in water-colours, sometimes elaborate borders to the pictures were partly pricked, partly coloured. As Cowper wrote:—

"The violet, the pink, the jessamine  
I prick'd them into paper with a pin."

Some surviving specimens of these pin-pricked pictures date back two hundred years and have a quaint and delicate charm of their own. The earliest are naïve little pictures of Saints and religious subjects painted in watercolours and surrounded by a border of the finest possible pin-pricked work in lace-like designs, conventional or floral. Indeed, the general effect is very much like the modern paper devotional pictures edged with paper lace: possibly the latter are their lineal descendants, only of a degenerate machine-made variety.

#### Fine Quilting Effect

Other pictures of this period show real skill in the pricking of draperies, giving something like the effect of fine quilting, and there are some portraits in Tudor and Jacobean dress, with the ruffs and lace collars most exquisitely executed. Altogether, it seems as though pin-pricking would stand revival as well as, or better than, many other minor arts.

Of the place of pins in romance and magic and in the folk-lore of many countries one cannot write here, nor of the small pin-pricks they have made in the pages of great literature. They are embedded in our own language through many homely sayings where they play the same part as they do in our everyday life, things so small yet so essential that they are taken for granted, until we pause for a few moments to look at them more closely.



## Two Island Volcanoes.

*The habits of the people and the history of two interesting Greek islands are described in this article. Both consist really of dormant volcanoes, and on one the inhabitants live in ever-present danger of catastrophe.*

By Stanley Casson.

PROBABLY the inhabitants of the island of Santorin—the Thera of the ancients—are the only people who live on the edge of the crater of an active volcano and periodically contemplate the activity of the cone of the volcano inside the crater below them. But ever since the modern villages that cling to the rim were built, the activity of the volcano itself has never been such as to destroy them or make their life impossible. Even so the contingency of catastrophe of a graver sort is always present and one infers that there must be some particular inducement to live literally "on the top of a volcano." The inducement is obvious enough to all travellers who touch at the shores of Santorin in the shape of an export trade in wine of a peculiar excellence. Santorin lives almost exclusively on this product combined with a large trade in volcanic cement, or *pozzolana*.

Santorin is the most obvious indication of a large crack or flaw in the subterranean surface of the earth which extends in an arc from southern Asia Minor across the Aegean to Cephalonia and thence, probably across the Adriatic to the region indicated by the activities of Stromboli and Etna and the earthquakes of Calabria. The islands of Nisyros and Kos, off the Asiatic coast give some indication of the point at which the flaw can be detected in the east, and its ramifications

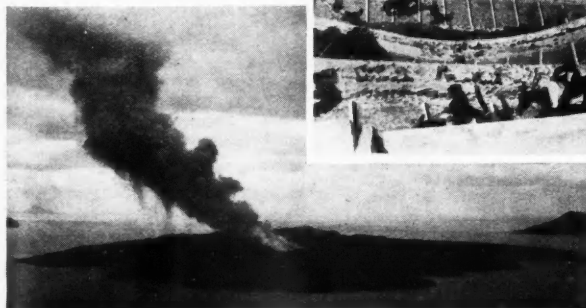
clearly extend into Asia Minor. Santorin is the main safety valve, but further west Melos, a crater-island like Santorin, shows where in the past there has been similar activity, and there are solfatara still on the south coast of that island.

From Melos the arc of volcanic disturbance turns sharply northwest and we find at Aegina and on the peninsula of Methana on the eastern Peloponnese as well as at Poros, indications of dormant volcanism. Thence through Corinth and the Corinthian Gulf, where earthquakes are particularly violent, the line goes due west. The island of Cephalonia is unique in possessing a natural phenomenon unparalleled elsewhere—the famous Sea Mills, where corn-mills are driven by a stream of sea water which flows into the land from the sea, ultimately vanishing down clefts and fissures of the natural limestone. The speculative have suggested that



*Above is shown the ancient wall of Melos and on the left the village of Santorin, looking vertically down to the sea.*

*The core of Santorin Volcano in eruption.*



this vast and continuous accumulation of water pouring into the earth penetrates the volcanic regions below, and results in earthquakes, due to a prodigious production of steam. I have yet to hear the expert opinions on this suggestion! But

the main line of the volcanic disturbances is evident enough, even to the ordinary traveller. The contrast between the relative freedom of Athens from serious earthquake and the periodic devastation of Corinth is very striking. The most recent earthquake at Corinth completely destroyed the town, but the tremors were hardly felt at Athens, forty miles away.

Santorin is certainly the most unusual and striking of all the Cyclades. Originally, it was a simple crater which rose above the sea, much like Stromboli to-day. A subsidence of the sea-floor probably produced the first great eruption at a remote period, perhaps in the early second millennium B.C. For then we know that the crater was inhabited, just as it is to-day, but that an immense eruption overwhelmed the early settlement and buried it under many feet of volcanic ash. The proof is found in the remains of a settlement of Minoan type and date excavated many years ago on what is now the separate island of Therasia, which was probably then part of the complete circular crater. This disturbance seems to have been followed by the upheaval of what is now the cone of the present volcano and its protrusion into the sea. The original volcano before the crater-sides were burst open and the sea flowed in must have erupted through much the same aperture, but the cone must have stood much higher.

### An Infernal Spectacle.

As your ship sails into the superb harbour formed by the crater, passing through one of the breaches in the crater side, you see the vertical sides of the crater, which survives to about 70 per cent. of its total circumference, encircling you and in the centre the formidable, black and violent-looking cone, barely a hundred feet in height, sprawled over the water, shoreless, tumbled and jagged, a truly infernal spectacle. Every few years it spouts again into liveliness and throws up a fresh stream of lava. The last activity was only a few years ago, when a new bulge was added to the sprawling mass and there was much display of smoke and flame.

The island is not wholly volcanic, since it consists of a Tertiary mass of limestone upheaved from the sea bed. But the island as one sees it on entering is in fact the interior of the volcano. The crumbling sides daily litter the sea with a scum of pumice stone which floats like dirty foam on the still dark water. The harbour is deep, reaching some 800 feet in places, and ships of small draught tie up to the crater side, or anchor to buoys. Down the steep sides here and there are vertical shoots down which are projected into the holds of waiting ships the *pozzolana* for export. Beyond thus discharging their soil, aided by gravity, directly into ships, a task that involves the minimum of exertion, the only other

occupation which involves the natives in toil is the growing of grapes, and this, once well started, is not an arduous task. So excellent is the wine, of a sherry type, produced that there is rarely a lack of demand and the island is almost always producing to a maximum.

The main modern town is approached from a small port by a zig-zag path laboriously laid in the vertical crater side as is seen in the central illustration on the previous page. The white houses of the town largely employ barrel-vaulting and powerful buttressing to withstand the perpetual shocks which the proximity of the volcano cone involves.

Life on Melos is very different. Here the volcano is so long dormant that it counts for dead, despite the hot springs that abound in the island and the sulfurous regions on the south coast. The villagers seem hardly aware that they, too, live around a crater. Yet the conformation of the island is identical with that of Santorin, though the catastrophe that burst the crater open to the sea must have been a very ancient one, before the time of human occupation. Yet the catastrophe is not so far distant that the Meliots in the seventeenth century could not forget to consider the possibility of another. An English traveller\* in 1687 notes that

"here are several hot places for men to sweat, at the side of hills, which in some places are so hot as to roast an egg, if put between the hollow of some stones. All the whole island is esteemed to have fire under it, which is thought to consume the stones, which are very like to honeycombs, being all hollow."

### Walls of Coloured Blocks.

One of the most attractive features of Meliot building is to see the wall of houses composed of a medley of coloured blocks, some mauve, some bright rose or purple, some of vivid yellow crystallised sulphur. Where Santorin has nothing but pumice and brown limestone for building, at Melos volcanic disturbances seem to have created immense variety of colour. As you walk round the coast you will see vivid alternations in the cliffs. Bright orange strata are followed by pure white. The white deposits consist of a silicatus, which is now exported to Athens, where, when subjected to heat, it transmutes without further trouble into pure glass. Here, indeed, is a source of some wealth to the island. Other minerals abound also, such as bismuth compounds, alum, sulphur and grit-stone. The whole island is a perfect mineralogical museum. In remote prehistoric antiquity it was the great emporium for one commodity, valueless to-day, obsidian. The prehistoric city at

\*Bertram Randolph. The present state of the islands in the Archipelago (or Arches), Oxford, 1687.

Phylakopi on the north coast seems to have been the centre of this trade and every city of the Minoan and Mycenaean world bought the material for its razors from Milo. To-day you will find endless fragments of obsidian, and countless flakes and cores, the relics of this ancient industry, littering the ground. It was exported above all to Egypt and Crete. One of the finest Egyptian masterpieces in the world, a royal portrait, was actually executed in Melian obsidian.

The people of Melos and Santorin alike to-day share a simple art, rare elsewhere, and perhaps a survival from antiquity, of paving the floors of their courtyards and public places with mosaic, made of pebbles of different colours. In technique this mosaic is identical with that used in ancient Greek cities of the fifth and fourth centuries B.C. It is a simple art that sometimes buds into small masterpieces. In Melos is a large floor

on which an eagle with outspread wings is admirably depicted. No traveller seems to have recorded the predilection of these islanders for mosaic work.

Compared with Stromboli, Melos and Santorin are comfortable islands. The solitary cone of Stromboli is a precarious foothold for a village and the inhabitants are naturally very few. The steep slope of the cone precludes building and the houses cluster, like frightened birds, on a ledge above the sea. Stromboli has no neighbours near and is a lonely place. Its cone is for many months of the year obscured in clouds. Periodically lava brims over the top and slides down into the sea, so that there can be no foreshore. At nights the flash of its fires is seen from far off. It has little charm, but a certain stately beauty. As at Santorin the few inhabitants cling to its sides because of the merit of the grapes grown on such a rich volcanic soil.

## Ancient Biblical Manuscripts.

By C. J. D. Gair, O.B.E., F.C.S.

*Readers of DISCOVERY have been kept well advised from time to time by Sir Frederic Kenyon of the new light that has been thrown on biblical origins by the discovery of manuscripts. Mr. Gair here sums up the state of knowledge which has been accumulated by these discoveries. Is the time now ripe, he asks, for a new translation of the Bible?*

WHEN we read in the second Epistle of St. Paul to Timothy, the words, "When you come to me, bring with you the cloak which I left at Troas with Carpus, and the papyrus rolls, and especially the parchments,"\* we realise at once the tremendous urge which early Christian leaders had, not merely to speak their message but to write it down. Fortunately for us they did this well, and the lapse of 1,500 to 1,800 years has not been sufficient to erase their words from vellum page or papyrus roll. As time goes by, the tale of discovery of these ancient manuscripts increases in significance, and because of this and the widespread interest aroused by their translation it seems desirable that an epitomisation be made at this stage. The following article, in an introductory manner, attempts to supply this.

The story goes back to the year 1844, when that grand old man of paleography, Dr. Constantine Tischendorf, acquired some forty vellum leaves of a Greek Old Testament of extreme antiquity from St. Catherine's Monastery. This monastery, appropriately enough, nestles at the foot of Mount Sinai. Fifteen years later he revisited the monastery and, in all, obtained 390 pages of this Bible, in which were included the complete books of the New Testament together with the apocryphal Epistle of Barnabas and a considerable portion of the

"Shepherd" of Hermas. The date of these manuscripts, which form the Codex Sinaiticus, is about 350 A.D. An interesting account, in Dr. Tischendorf's own words, will be found in a little book called *Codex Sinaiticus*, published for a shilling by the Lutterworth Press.

In 1892, two ladies, Mrs. Lewis and Mrs. Gibson, discovered at the same monastery the text of the Gospels in Syriac. These were written about the same time as the Codex itself.

We come now to the work of the two eminent papyrologists, Messrs. Grefall and Hunt. This work is of double interest because it connects directly with the remarkable discoveries of the present year. These we shall consider later. The two indefatigable searchers of ancient Egyptian rubbish heaps found (1897) near Behneseh (Oxyrhynchus), a town on the edge of the Western desert, a papyrus fragment on which were written portions of the "Sayings of Jesus." Seven years later a second fragment was recovered. Specimens may be seen in the MSS. department of the British Museum.

In 1906 Mr. C. Freer acquired a group of ancient manuscripts on vellum. One of the most interesting of these is an apocryphal addition to the last chapter of St. Mark's Gospel. Dr. James gives a translation in his book, *The Apocryphal New Testament* (Clarendon

\*Dr. Wade's Translations

Press). Nothing of much importance was discovered after this for some twenty-five years, and then, in 1931, a group of Biblical papyri in Greek were obtained by Mr. A. Chester Beatty.

Sir Frederic Kenyon's excellent description of these will be found in *DISCOVERY* of November, 1933. The find comprised no less than 190 leaves of papyri, on which were written in Greek portions of Genesis, Numbers, Deuteronomy, Esther, Isaiah, Ezekial, Daniel, Ecclesiasticus, Matthew, Mark, Luke, John, Acts, Romans, Philippians, Collosians, Thessolonians, Revelations and part of the lost text of the apocryphal book of Enoch. Considerable mutilation has taken place, but what remains is sufficient to constitute one of the most remarkable additions of modern times to ancient scriptural text. According to the account written by Sir Frederic Kenyon, the ages of various portions of the above differ considerably, Enoch, for instance, dates

from the fourth or early fifth centuries, whereas the New Testament (28 partial leaves) was written mostly in the early part of the third century, say about 230 A.D., which brings it within range of sub-apostolic times.

Space unfortunately forbids further details of the above find, and we pass to the most recent discoveries of all.

In the summer of 1934 the British Museum authorities obtained two imperfect papyrus leaves and a fragment of another leaf of a Greek codex, the words of which were found to be absolutely unique. Briefly, we have here a fragment of a *New Gospel*. It is, of course, non-canonical, but in that fact lies much of its interest. The work is of immense age, and according to experts may be dated with great probability to between 130 A.D. and 165 A.D. Considerable imperfection in the text is apparent, but sufficient is left to permit of the restoration of some 46 lines. Though dissimilar in wording there is a considerable likeness here to parts of the four canonical gospels. This fact indicates probably one or other of the following conclusions, either *The New Gospel* is a comparatively late work and depends on the canonical gospels or it depends on a source common to all. The British Museum publication, entitled, *The New Gospel Fragments*, sums up the situation in the following words: "It may be . . . that the author of *The New Gospel* knew the Synoptic Gospels or one of them, but that he used them, if at all, from memory only and combined with them matter from some other source or sources."

#### A Discovery at Manchester

We come now to the year 1936. The John Ryland's library of Manchester needs no introduction to readers of *DISCOVERY*, and it was here that some of the most valuable manuscripts of an evidential nature were unearthed and deciphered during the past two months.

It appears that an examination was being made of scraps of MSS., etc., lying in the library, and enclosed in a bundle of miscellaneous papyri, purchased in 1917 by Dr. Rendal Harris, was an envelope containing two pieces of cartonnage or mummy wrapping. The plaster from these pieces of cartonnage was removed by acetic acid (vide, *Two Biblical Papyri*, by C. R. Roberts, M.A.), and after a little research the separation of the various constituent parts was effected by immersion in boiling water for one minute. No damage was done by this drastic treatment, and on scraps of the papyri were found parts of the 23rd, 25th, 26th and 28th chapters of Deuteronomy in Greek dating back to the 2nd century B.C.; by far the earliest manuscript of the Holy Scriptures extant.



The Chester Beatty papyrus of the Apocalypse, which dates from about 230 A.D.



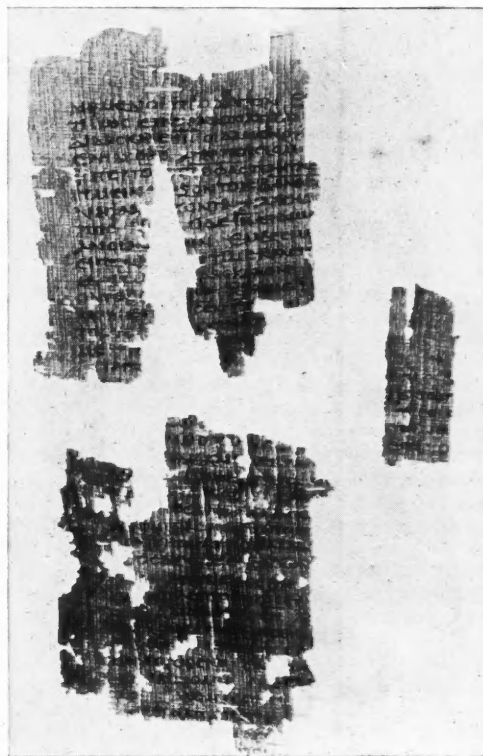
About the same time and during the sorting of the residue of the Grenfell collection, Mr. Roberts found the gem of gems in the shape of a fragment of St. John's Gospel of almost if not quite apostolic times. This fragment is older by 100 years than anything in the Chester Beatty group, and may be taken with high probability to have been written not later than 150 A.D. From the few decipherable words left, verses 31-33 and 37-38 of Chapter 18 have been pieced together and show something of that wonderful picture of Christ before Pilate, given with dramatic force in the fourth Gospel.

Mr. Roberts points out that this all-important fragment tends to support the critics who favour an early date, *i.e.*, late first or early second century, for the composition of St. John's Gospel rather than those who still regard it as a work of the middle decades of the second century. In passing, it may be stated that in it there is marked agreement with Codex Vaticanus, Codex Ephræmi, and Codex Bezae.

### A Significant Question

At this point we must leave this fascinating subject, but the question of its significance has still to be faced. Similar discoveries to those which we have been considering led to the Revised Version of the Bible published in 1885. Since then much has been learned about textual origins, and as time goes by the call for still further revision becomes urgent. Several attempts by individual scholars have already been made and invariably the trend has been to re-translate the New Testament into modern English rather than into that of the Authorised and Revised versions. I need only mention three such attempts: Moffatt's *New Translation of the New Testament*, Weymouth's *New Testament in Modern English*, and quite recently, Dr. G. W. Wade's excellent *Documents of the New Testament*. The study of the above three works is a matter of deep interest, but in doing it the reader will, no doubt, realise how much is owed to King James and the translators appointed by him in 1604. The music of their work, the Authorised and from it the Revised version, still lives in the heart of this nation and no modern edition of the Bible, however exact it may be, will prove an equal success unless with translation is incorporated the almost lyric quality of that prose. Where narrative is concerned Dr. Wade's translation is a distinct success; the Gospels, Acts, and certain parts of Revelation are not only the last word in knowledge but most readable.

We need, however, another William Tyndale to make the messages of St. Paul live in our *modern* English tongue as the inspiration we have always known.



The three fragmentary leaves of the Codex with the new Gospel text.

### Books Received.

(Most of the books listed here will be reviewed later.)

- Miners' Safety Lamps.* By T. R. BARNARD. (Pitman. 4s.)
- Mercury Arcs.* By F. J. TEAGO and J. F. GILL. (Methuen. 2s. 6d.)
- An Introduction to Neon Lighting.* By JAMES ORR and A. W. FORREST. (Blackie. 3s. 6d.)
- Portugal: a Book of Folk Ways.* By RODNEY GALLOP. (Cambridge. 15s.)
- The Paradise of Fools.* By MICHAEL MASON. (Hodder & Stoughton. 15s.)
- New Stories of Old Things.* By E. HUGLI-CAMP. (Dent. 5s.)
- Gari Gari.* By H. BERNATZIK. (Constable. 15s.)
- My Legacy Cruise.* By MRS. ALEC TWEEDIE. (Hutchinson. 18s.)
- Audubon.* By CONSTANCE ROURKE. (Harrap. 12s. 6d.)
- Unknown Karakoram.* By R. C. F. SCHOMBERG. (Hopkinson. 15s.)
- Sacrifice to Attis.* By WILLIAM A. BREND. (Heinemann. 10s. 6d.)
- Suwarrow Gold.* By JAMES COWAN. (Jonathan Cape. 7s. 6d.)
- Spider Wonders of Australia.* By KEITH C. McKEOWN. (Angus Robertson. 6s.)

## Book Reviews.

*Out of the Night. A Biologist's View of the Future.* By PROFESSOR H. J. MULLER. (Gollancz. 4s. 6d.)

This vigorous little book, recommended by Professor J. B. S. Haldane, will arouse a good deal of interest and even enthusiasm, but must also, as we shall show, suggest some disquieting thoughts, which go to the root of man's interference with nature. We will take the plainly acceptable aspect first, if only for the reason that it dominates the whole. Our reservations are subsidiary. The general thesis is that man's power over nature, including his own nature, has been so enormously extended by recent discoveries of science that there is no limit to the changes that he might effect. Some of those suggested are, as we shall see, rather fantastic or even worse. But one must welcome the spirit of hope. Especially commendable are the two pithy sayings which summarise the whole. They deserve to be remembered:

"Wit foils weight and skill enshackles strength."

"Love must balance knowledge or we fail."

The author is a biologist and he, therefore, ends and specialises on what may be done by the study of genetics. But he deals also with the possibilities both of extending and adapting physical machinery and with the infinite resources open to the chemist. Machinery must be humanised and made more beautiful. The chemist, by exploiting the artificial combination of elements, may make mankind, to any degree that is desired, independent of the simple natural products of the soil or of the animal kingdom. How far do we desire to go in this direction, how far is it good for the stability of our moral nature to divorce ourselves from our original contact with the earth and live in a more and more intellectualised atmosphere? These are serious questions for the future.

Professor Muller rarely has any qualms, and for a large part of his argument most of us will be prepared to go with him. It is clear, for instance, that we shall shortly be driven to seek other sources of power than are afforded by the temporary combustion of oil and coal. He touches shortly on the major and permanent sources of power which are for the most part yet untapped. Sunlight, wind, waves, tides, subterranean heat, and, possibly, the motion of the earth, as well as the immeasurable forces in the interior of the atom—all remain to be explored. He joins quite confidently with those who expect shortly to be able to journey in space and make connection with the other lives which must be found in numberless regions in the universe. All this is highly exhilarating, and, so far as the other lives are concerned, seems on the whole most probable. It is probable, and heartening, too, to think that the universe contains many gathering-places for fresh stores of energy which will prevent the second law of thermodynamics proving the end of all things.

It is rather on the side of his own special studies that Professor Muller raises our doubts and apprehensions. He rightly and most illuminatingly points out that the human body is, in complication and the fitness of its work together, far the most wonderful thing known to us in the universe. The microcosm is not only the centre, but surpasses the macrocosm. Now it should be noticed and remembered that this unique and commanding position has been achieved by the action of forces not consciously directed by man himself. The universe became conscious in man before man began to think about the universe, or to make the plans for its improvement of which Professor Muller gives so enthusiastic an account. This thought should surely

give us pause in schemes for remodelling the human organism which experimental biology is beginning to throw up. We might—so we are told in this book—by "artificial insemination" produce a race containing as many "Lenins or Darwins" as we pleased. We are encouraged by the results of experiments on rats and birds to think that fundamental characteristics, such as sex, may be altered before birth or, as in Professor Haldane's "ectogenesis," that the whole process of embryonic development might be carried on outside the body of the mother. One may safely leave aside for the moment—probably for many moments—the moral and æsthetic reaction of such ideas on the minds of men, and still more of mothers, and return to a more fundamental question suggested by history. Is it not a commonplace of industrial history that the revolution of the last two centuries was largely marred in its results by the want of moral preparation in the society which suffered it? The mechanising mind had outstripped the moralising capitalist; and the problem still faces us, sometimes in yet more menacing forms. We have learnt the art of destroying whole cities by bombs before we have gained the common-sense of treating all cities as fellow members in one indissoluble and co-operative brotherhood. We need badly to make up the leeway there. Most of us will think that we need it still more when asked to contemplate experiments of a fundamental, though probably quite impossible, character on the supreme organism built up by the unconscious wisdom of untold ages. Healing known evils in the spirit of humanity is the pressing task, and will take some time.

F. S. MARVIN.

*The Common Cold and Influenza.* By J. E. R. McDONAGH, F.R.C.S. (Heinemann. 12s. 6d.)

In the Prologue to this work the author emphasises the importance of correlation between laboratory and clinical observation and deplors the over-specialisation which has gradually crept in and checked many valuable conclusions in medical science. The results of an unbiased investigation into these problems has led to the conviction that the common cold, being an acute manifestation of disease, is allied to hay-fever, and is due, not to a pre-supposed ultra-microscopic virus, but to certain internal derangements. It is contended that disease is indirectly, not directly the result of bacterial activity—that lesions are caused by some specific change in the protein particles in contact with micro-organisms in the large intestine.

What is generally spoken of as a bacterial invasion in any part of the body other than the intestines, is an acute manifestation of a secondary phase of the disease which resides in the bowel. It is quite justifiable, therefore, to use the term "Influenza" to denote such acute invasions since the word is derived from "influence." One of these "influences" is the over-exhibition of lymph cells in the blood on account of the enlargement of certain lymphatic glands due to the hydrating effect which bacteria have upon protein. A discussion of "hydration" occupies a principal theme in the present work.

The author's remarks on general care of health, although brief, are important. Food is the most important thing in a man's life, and Dr. McDonagh emphasises the necessity of careful cooking of it. His advice is to avoid canned food, while alcohol should be used only in moderation and tobacco abstinence is essential for those suffering from intestinal inflammation. Many of the

evils of after-life are due to lack of attention on the part of parents and school authorities. Every child should be taught to sit down after a meal. School meals, like school lavatory accommodation are often of the worst possible type, the latter lacking both in hygienic requirements and in quantity in many schools.

Likewise, brief but important are the remarks on colonic lavage, which may be distinctly harmful if undertaken frequently and especially by the patient himself—a year's interval is recommended—it should not be resorted to in acute disease.

Regarding the mutation of bacteria into sub-groups, very illuminating evidence is given of the incident of epidemic outbreaks. In 1932-1933 Friedländer's bacillus (the first mutative form of the coli bacillus) was completing a cycle, causing the prevailing influenza in various guises. Measles and certain skin affections too, are the result of these sub-phase mutations and immunity against them has rendered it difficult for them to be transmitted from man to the lower animals. In summer influenza the protein particles of the blood plasma are subject to hydration, in early winter dehydration takes place while rehydration in late winter is followed closely by an epidemic in February and March—this explains why a winter epidemic is more severe than a summer one.

The bacteriological section will appeal to the laboratory worker especially in the light of the recent work of the Medical Research Council under Sir Patrick Laidlaw. Investigation of ten virus strains has shown the primary cause of influenza. Dr. McDonagh says (p. 105) that it is due to the fact that the bacillus (Friedländer's) is gradually becoming saprophytic again (cycle following upon cycle in rapid succession) that no immunity against infection is afforded by an attack of influenza in man. Such remarks coincide with the Research Council's findings—the loss of efficiency of the "anti-bodies" generated in the system during an attack. This is the chief difficulty in the prevention of "flu."

Altogether the book is recommended to the serious student of hygiene, the bacteriologist and general practitioner—its pages contain much valuable technical data and it cannot fail to stimulate the mind to an entirely new field of inquiry which questions the validity of the germ theory of disease.

FRANK W. BRITTON.

*The Future of Marriage in Western Civilisation.* By DR. EDWARD WESTERMARK. (Macmillan. 12s. 6d.)

Marriage is a many-sided business, and those who enter upon the discussion of its problems and its future, if any, are prone to allow themselves to be obsessed by a single point of view, allowing little weight to any other. Professor Westermarck's world-wide knowledge of the institution of marriage in its manifold forms and his devotion to research into its history ensure that his treatment of the problem of marriage in modern western civilisation should not err through confusion between a convention which is ephemeral or limited in its distribution and an essential condition of social well-being.

The institution of marriage, as a world-wide survey shows, may serve ethical, social, or economic needs, and these may appear to determine its form with finality. Fundamentally, however, marriage is the union of two sexes for the perpetuation of the species. In man in the long run, this union has attained its object most effectively in the form of the permanent monogamous marriage. Notwithstanding a considerable amount of

argument, this seems on the whole to be the trend of observation.

It is this form of marriage, however, which is now on its trial in western civilisation. It is alleged that it has outlived its usefulness and various alternatives, or alleviations, have been brought under discussion. These, Professor Westermarck discusses in detail, each one in turn being dismissed, as in his reasoned opinion in the long run unlikely to prove adequate to the purpose.

In arriving at the conclusion that marriage and the family are institutions which are likely to prove permanent, as best serving human needs, he relies on the psychological argument; and he closes with the proviso that if and when human nature changes, then nothing can save them.

*An Introduction to Cultural Anthropology.* By ROBERT S. LOWIE. (Harrap. 10s. 6d.)

A text-book by Dr. Lowie carries its own *imprimatur*. The issue of an English edition of his introduction to the study of cultural development, which has won high standing in anthropological literature since its first publication in the United States two years ago, makes more readily accessible to students in Great Britain a survey of recent material from ethnographical investigation on lines for which, notwithstanding innovations, there has been no thoroughly satisfactory substitute since Tylor's *Anthropology* was first published, now fifty years ago. In his review of material culture, social organisation and religious belief, Dr. Lowie's aim has been to present essential fact topically, avoiding theoretical discussion, and while presenting a picture of the peoples of lowest culture, to stress adequately those who link on to historic civilisations. Although discussion as such is avoided, it would hardly be the Dr. Lowie we know, if very definite views on controversial questions were not expressed. This, however, with an author of his sanity, is no detraction. His treatment of art and his view of the domestication of animals, for example, are admirably concise and well-defined statements, which serve as instances in point.

*Your Body: How it is Built. How it Works.* By D. STARK MURRAY. (Watts. 1s. 4d.)

I have read Dr. Murray's book with care, and I confess I have not learnt entirely how the body is built, nor exactly how it works. But I have been given, in readable, understandable form, a very fair picture of orthodox physiology and, let us agree, this is a remarkable achievement in a book costing only one shilling. Why are we, somewhat ungratefully, disappointed? First, I think, because it is uncritical. This is due in part to the author's lack of space and also to the science which he has described.

Physiology is only just emerging from the descriptive phase. Now, classification and description introduce an element of unreality, and this is our second criticism. Future ages will think it very curious when they find that we chose to describe such a straightforward process as breathing in terms of the analogy of a motor-cycle engine. Still, perhaps Dr. Murray is right in not idealising his audience and in writing a most serviceable, if somewhat unimaginative, book.

*Biology in the World To-day.* By L. ANDERSON FENN. (Methuen. 2s. 6d.)

This is a book written for, and by, an educated man. By this, I do not mean one who has had a long and expensive preparation towards passive acceptance of world conditions, but one who has developed his capacity for keeping critical and awake. Mr. Fenn has excellent critical powers and, educating us, keeps us awake, first, by his racy style and, second, by the dramatic content of his book. In the matter of style, he has escaped from ordinary modern English, which H. L. Mencken and Sir Arthur Quiller-Couch have described as politely suited to the prospectuses of commercial companies. We must say more of the content.

Here, at last, is a face-up to the relations between science and society. "The scientist, like every creative worker, needs an audience—so that it is necessary for him to speak of things which non-scientific people understand." Again, society, having unconsciously directed the research, is hit by it in various ways. The 19th century eventually received Darwin's Natural Selection, for, "in a society where the triumphs of applied science reared themselves above a festering mass of poverty and misery . . . it was comforting to believe that this selvedge of shattered lives was but the debit side of a social account, whose credit side showed a handsome balance of increasing human power and well-being." In the later parts of his book, Mr. Fenn tends to fall between the two stools of criticism and exposition. This is, perhaps, inevitable in a book written for those who need have no previous technical knowledge and, in either case he is stimulating. I, for one, would welcome another, more comprehensive, work by Mr. Fenn, on the relations between biology and society.

*Historic Cyprus: a Guide to its Towns and Villages, Monasteries and Castles.* By RUPERT GUNNIS. (Methuen. 8s. 6d.)

This is the most useful and instructive type of guide-book, and the Government of Cyprus are to be congratulated on sponsoring so attractive a work. The author, resident in the island, has made what might be called a *catalogue raisonné* of every village and ancient site of the island. He claims to have examined in detail the 670 villages and 1,800 churches and chapels of Cyprus. The island is a palimpsest of cultures and this guide-book reveals to the reader how, in each place, prehistoric Cypriots, Classical Greeks, Romans, Byzantines, Lusignans, English, Genoese, Venetians, and Turks have left their accumulated traces. The pages of the book are packed with information derived partly from older writers, partly from archaeological reports, but, most interesting of all, from the personal research of the author. He is thus able to tell us a very great deal that is not recorded elsewhere in print, legends of the innumerable Cypriot saints, folklore, local superstitions, memories of ancient events, and all the surviving echoes of the past.

We tend to forget to-day that in its time Cyprus was world-famed. It was, from the 12th century A.D., a paradise that attracted Crusaders from their proper goal, that lured the French knights to stay there for three hundred years, living a more romantic life than they could ever have lived in France, that drew the envy of Venice and finally brought in the rapacious Turk.

No part of the Mediterranean is so packed with strange tales and curious events. The Monastery of St. Nicholas of the Cats

enshrines a story that was world-known in the 17th century to adventurous travellers. The strange trilithon in the Tekke Um Haram near Larnaka still remains a mystery and may or may not be a megalithic monument of prehistoric age. The curious Moslem shrine of Kırklar may be as old; at Paphos, St. Agapetikos, patron deity of love, inherits the shrine of Aphrodite and a local legend describes the curious courting of a notable but anonymous queen of Paphos. Lovers still visit the cave-church which ultimately became the Queen's abode.

Mr. Gunnis has briefly but adequately recorded the main objects of premediaeval archaeological interest, but more fully devoted himself to precisely those periods which have for so long been most neglected—the Latin and Byzantine. No traveller to Cyprus now will find even a single mile of Cypriot countryside devoid of interest. This guide-book can rank as one of the most efficient and desirable that could be asked for. Plans of the larger towns and a good map of the island make its use easy. Despite its 495 pages the book is compact and portable.

STANLEY CASSON.

*The Southern Gates of Arabia.* By FREYA STARK. (Murray. 16s.)

This admirable and exciting volume has made as great a sensation as any book of travel published this season; and justly so. A second volume from the hand of the writer of *The Valley of the Assassins* was awaited with eagerness; but the author had set herself a high standard. Would she again attain it?

An unqualified affirmative must be the answer. Of the limited number of volumes written in English on the Hadhramant, this is unquestionably the most readable. And the extraordinary thing about it is that, from the author's point of view, it is the record of a failure. The secrets of Shabwa and the Incense Roads remain veiled; the gallant explorer's heart gave out, and in her courage she nearly sacrificed her life.

There is a certain type of Western woman who makes a better observer of the East than almost any man. She has, of course, an unfair advantage in being able to penetrate into the apartments of the harem, and so can present the Oriental scene from a new angle; but the woman of this type can range herself alongside the best male explorers without this advantage. Miss Stark's account of the Hadhramant—its desert approach, petty wars, absence of sanitation, magnificent architecture—and its present-day approaches towards modernity—places her in the class of Isabella Bird and Gertrude Bell. A word of thanks is due to the Royal Air Force for their timely rescue of the author; Miss Stark's work is far too valuable for it to be interrupted in its heyday.

*The Concise Oxford Dictionary of English Place-Names.* By EILERT EKWALL. (Oxford University Press. 15s.)

Everyone, or nearly everyone, is interested in the derivation of place-names; but, unfortunately, there are few matters in which popular explanations and popular tradition are so frequently wrong. This, in fact, is an excellent field from which to draw examples of the tendency of the folk to mythologise. Those, however, who possess the *Concise Oxford Dictionary* will have no excuse for the exercise of their ingenuity in conjecture. In his preface Dr. Ekwall, already well known for the excellence of his work on the names of English rivers, sets



out the principles that govern research into the origin of place-names, and in the body of his work gives in alphabetical order a list of English place-names and the chief elements in forming them, which, if not entirely exhaustive, is sufficiently full to meet more than the needs of most enquirers.

Dr. Ekwall classifies place-names under various headings—folk-names, such as Hitchin or Ripon, and the more generally familiar habitation names ending in *ham* and *ton*, names of Latin, Celtic, Danish derivation, and so forth. Such names as these, when their meaning is appreciated, give a sense of reality to the data of archaeology and local or national history, while they often afford a clue to settling the puzzles of the archaeologist and the student of early English social customs and institutions.

As Dr. Ekwall's *Dictionary* is planned for ready reference, the alphabetical arrangement is inevitable; but place-names cannot be studied properly apart from their local context. The County volumes of the English Place-Name Society are still indispensable, especially as those who have assisted in the compilation of the volumes which have appeared, have the advantage of local knowledge which Dr. Ekwall cannot be expected to possess.

*Kilango.* By M. CATHCART BORER. (Pitman. 3s 6d.)

Miss Borer has used her knowledge of some of the East African peoples to provide the background for this pleasant little book about two boys of the Akikuyu tribe. It is definitely a book for children and for that reason, as she explains in her preface, the author has crammed a surprisingly large number of adventures into a short space of time but the result is such that the young reader's interest is not likely to flag. It should make an admirable book for reading aloud to the smaller children, in which case the grown up reader would find it more entertaining for himself or herself than many books suitable for the purpose. The choice of a book to give a child is often a difficult undertaking and to those who are up against it we can recommend *Kilango* as a safe bet where the destined recipient is between the ages of 6 and 11.

*An Introduction to Astronomy.* By ROBERT H. BAKER (Macmillan. 12s. 6d.)

This is really a text-book, intended for the more elementary courses in Astronomy, taken by American college students. And a most excellent text-book it seems to be, within its avowed limitations; for it is stated by its author to be but a simplified version of a more elaborate work of his, designed for those taking a more extended course.

Professor Baker, in his own words, "undertakes to tell the story of the heavens in a way that will be understandable without special preparation." In this undertaking he has been most successful, for there is nothing in the book that is beyond the grasp of an intelligent boy or girl of fifteen. At the same time the treatment is reasonably complete and very much up-to-date, while the illustrations are particularly well chosen and less hackneyed than those with which we have become monotonously familiar in most text-books. Moreover, at the end of each chapter is a selection of thought-provoking questions which add greatly to the value of the book. There are also short bibliographies at frequent intervals; but, as the works referred to are mostly of American authorship, and not much read or

easily obtainable in this country, this feature will naturally be less useful to English readers. The text as a whole has also a very American flavour, as might be expected; but these objections, which are only such from a purely British point of view, do not greatly detract from the real value of the book as a handy work of reference. In fact we think the publishers are fully justified in the advice which they address to the student reader:—"Unquestionably, you will many times in later life wish to refer to specific details and facts about the subject which this book covers and which you may forget. . . . Retain it for your reference library. You will use it many times in the future."

*Fundamentals of Biochemistry in Relation to Human Physiology.* By T. R. PARSONS. (Heffer. 10s. 6d.)

This book, now in its 5th edition, was first published in 1923 to describe in a continuous story the more important generally-accepted principles which have been derived from the study of chemical changes occurring in the human body. Previous to its appearance the theoretical treatment of physiological chemistry was confined to books which contained much more information than was needed by readers seeking an elementary introduction to the subject. In this new edition an account of muscle chemistry has been included, and the section on sterols has been enlarged to deal more adequately with the rapidly advancing knowledge of this important group of substances. Changes have been introduced also in those sections where vitamins and tissue-oxidations are discussed. The original aim of the book, however, has been carefully preserved so that it continues to provide an introduction to the subject of biochemistry for students of medicine and science. Each chapter concludes with an annotated bibliography leading to deeper reading, and in several cases there is a very useful summary of chemical changes present in schematic form.

*Intermediate Botany.* By J. L. F. BRIMBLE. (Macmillan. 8s. 6d.)

The author of this book has made a special point of emphasising the economic and other useful applications of plants and their products, in order to bring botany into closer contact with everyday life. Strict adherence to examination syllabuses has, therefore, been disregarded in places to include special aspects of the subject, e.g., virus diseases and medicinal plants, although the general scope of the book has been determined by Higher School Certificate, Intermediate Science, Agriculture, Veterinary Science, and Pharmacy and Medical Examinations. The illustrations, of which there are 337, have been selected to create an interest in the subject of botany and are more varied than the usual text-book standard, but greater care could have been given to the printing of the half-tone blocks in order to show more minute detail. There are particularly interesting chapters on fruits and seeds (full attention being given to dispersal and germination), irregular nutrition and disease (with an account of saprophytic plants, e.g., fungi, and semi-parasites, e.g., mistletoe), evolution and plant breeding (with an outline of the work of the Abbé Mendel), and the plant and its surroundings. Most chapters are provided with an outline of practical work, and there is an index that is more than usually extensive and helpful.

*Worlds Without End.* By H. S. JONES, Astronomer Royal. (English Universities Press. 5s.)

In this book, intended for the general reader, the Astronomer Royal gives an up-to-date picture of the Universe, as revealed to us by observation. The author uses simple language, dispensing with technical terms, so far as is possible in treating of such a subject, and there are no mathematics to frighten the timid layman.

In recent years there have appeared several popular treatises of somewhat similar scope and character; but too often, as it seems to us, the undue stressing of the more sensational aspects of modern cosmogony has upset that proper balance which would have made them good introductions to astronomy.

The author of the work now before us is no armchair scientist, but an experienced astronomer, with intimate and practical knowledge of the subjects of which he writes. As a result one feels that his account is authoritative, while the treatment is at once thorough and well balanced.

Dr. Jones has succeeded in compressing a great deal of solid information into a relatively small compass. At the same time, his book is far from being a mere catalogue of isolated facts, and the several chapters are welded together into a coherent and very readable whole. Throughout the book, which is very nicely illustrated, the author has been at pains to distinguish carefully between what has been definitely established by observation and what must still be regarded as pure speculation; and this cautious attitude will commend itself to those who would rather be instructed than merely thrilled.

The general excellence of the Astronomer Royal's book makes it all the more regrettable that it should have been allowed to go to press disfigured by a number of minor errors which could easily have been eliminated by a more careful reading of the proofs. Only a few of these errors are serious enough to mislead the careful reader, but one hopes that they will be corrected in the next printing of a book which otherwise deserves to pass through many impressions.

*Sea Trout and Trout.* By W. J. M. MENZIES, F.R.S.E. (Edward Arnold. 10s. 6d.)

Mr. Menzies here adds another book to the bibliography on trout, and though he terms it a mere introduction to the serious study of the whole question it is difficult to see that this is not mere modesty. After all, he deals in detail with the life history of trout, the methods of marking, scale study, etc., and short of analysing its soul there is not much left to write about.

In this book there is much that is old and a little that is new. In general, fish are suffering from a surfeit of facts and theories at this time. All are interesting, but (like the meteorologists' statistics) none of them seem to lead anywhere. The study ends in a welter of facts: some day a key will be found to give them a significance which to-day does not exist.

I shall probably be challenged in this statement, but I shall stick to my guns. The migratory habits of fish are, I think, over-emphasised. All animals tend to return to native and familiar haunts at breeding time, and there seems no point in stressing this movement of fish. In any case a study of the track followed by marked fish is valueless without a guide map indicating the flow of currents of water, the temperature of such water, and the food on the sea bed.

Are the salmon and the trout being credited with too much sense? Is a fetish being made of statistics and theories which go to great trouble to prove natural instincts exist? There is

one thing which the author has humanly hinted at, and that is how "glad" some of us would be to catch trout of "even lesser weight" than 10 and 20 pound fish. Very true, Mr. Menzies, very true. One feels a great step towards understanding trout would be made if someone could explain why they commit *hara-kiri* on the hooks of some anglers!

*The Materials of Mediæval Painting.* By DANIEL V. THOMPSON. (Allen & Unwin. 7s. 6d.)

The author of this work is recognised as among the world's foremost experts on the subject; and Mr. Berenson, perhaps the greatest living art-critic, contributes a thought-provoking foreword on the place—important even though ancillary—of the history of technique in art-history.

The book deals at length with the "carriers," grounds and primings, binding media, pigments, and metals, used in mediæval art. It is thus full of technical detail, but is written in so easy and colloquial a style, and warmed with so much enthusiasm, that it is highly readable.

Some of the painting materials used in the Middle Ages, e.g., ear-wax, would be incredibly odd, was not their use well documented; and one can but admire the fertility of invention of their originators. As well as an astonishing number of facts for a book of its size, some delightful fictions are mentioned, such as Bartholomew Anglicus' account of the fight between the elephant and the dragon, which, it was believed, produced the pigment (really a resin) known as dragons'-blood.

The idea of intrinsic worth—expensiveness—was greatly valued in mediæval art, and a large section of the volume is devoted to the various ways in which gold was employed, and to the technique—often highly elaborate—of its use.

The book suffers—as must any work that deals at all with colour in the abstract—from our lack of a standardized and universally-recognized scale of hues. Was the "purple" of Byzantium, made from Mediterranean whelks, the same colour as the "crimson" that, according to Bede, used to be extracted from British ones?

MARY BARNE.

*Road Amundsen, Explorer.* By CHARLES TURLEY. (Methuen. 5s.)

To make a readable book from the life of a man who from boyhood had only one ambition, who strove for this ambition for many years, achieved it, and finally went to a glorious death is not difficult. But there are pitfalls; one is to magnify the obstacles encountered, another to give luck too much credit. Mr. Turley steers clear course between these. He shows how time and again fortune saved Amundsen from an early death, but how the success of his journey to the Pole was due entirely to his masterly organization. He shows also that Amundsen's forward march to world fame was checked at many points by factors which might have forced lesser men to abandon the project, but were certainly no more than an explorer may expect.

The book is not well written. Such passages as "the pain and swelling combined to knock Amundsen completely out for some time. And that took a lot of doing"; such passages as these will not commend themselves to many. In fact for the stylist, and for the reader with a penchant for hair-splitting, the book might prove infuriating. One visualises, further, that library copies will soon collect a profusion of marginal notes. But for anyone who likes a story of a very brave man enthusiastically told, it will prove a good five-shilling's worth.

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